



Pay for Performance

Case Studies in Ecological Restoration and
Green Infrastructure

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Acronyms

BARC	Beltsville Agricultural Research Center
BMP	Best Management Practice
CBP3	Community-based Public-Private Partnership
CMAC	Continuous Monitoring and Adaptive Control
CMR	Construction Manager at Risk
CPRA	Coastal Restoration Protection Authority
CSO	Combined sewer overflow
CWA	Clean Water Act
CWP	Clean Water Partnership
DC	District of Columbia
DEQ	Department of Environmental Quality
DENR	Department of Environment and Natural Resources
DMS	Division of Mitigation Services
DWH	Deepwater Horizon
DWM	Department of Watershed Management
EEP	Ecosystem Enhancement Program
EIB	Environmental Impact Bond
EIP	Ecosystem Investment Partners
ENR	Enhanced nutrient removal
EPA	Environmental Protection Agency
EPIC	Environmental Policy Innovation Center
ESA	Endangered Species Act
GEBF	Gulf Environmental Benefit Fund
GI	Green infrastructure
ILF	In-lieu Fee
MDE	Maryland Department of the Environment
MMA	Master Maintenance Agreement
MPA	Master Program Agreement

MS4	Municipal Separate Storm Sewer Systems
NC DOT	North Carolina Department of Transportation
NEPA	National Environmental Policy Act
NGO	Non-governmental organization
NPDES	National Pollutant Discharge Elimination System
NRD	Natural Resource Damages
NRDA	Natural Resource Damage Assessment
OEM	Office of Environmental Markets
P3	Public-private partnerships
P4P	Pay for Performance
PFS	Pay for Success
PRM	Permittee-responsible mitigation
RES	Resource Environmental Solutions
RESTORE Act	Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act
RFP	Request for Proposals
RFQ	Request for Qualifications
RSIQ	Request for Statements of Interest and Qualifications
SIB	Social Impact Bond
TCEQ	Texas Commission on Environment Quality
TIG	Trustee Implementation Group
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
VFM	Value for Money
WIP	Watershed Implementation Plan
WLS	Water & Land Solutions
WPRF	Watershed Protection and Restoration Fee
WPRP	Watershed Protection and Restoration Program
WRP	Wetlands Restoration Program

Introduction

It's been a quarter of a millennium since a small part of Prince George's County, Maryland, was peeled off to become part of the United States's new capital city of Washington, DC. The change in jurisdiction went unnoticed by the water cycle. Stormwater on both sides of the boundary spilled into the shared Chesapeake Bay even then. Two hundred and fifty years later, there is much more stormwater carrying pollutants into the Bay, thanks to the spread of people, parking lots, and asphalt across the landscape.

Fortunately, both the County and the District of Columbia are pursuing a similar solution. Both are expanding their use of rain gardens, bioswales, and other forms of green infrastructure (GI) to reduce the flows of untreated runoff, and both jurisdictions are also now experimenting with new ways of financing and implementing those improvements. Washington, DC, for example, recently issued the world's first environmental impact bond (EIB), which pays investors based on how well the new green infrastructure performs. Prince George's County has farmed out large parts of its green infrastructure expansion to a private company that gets paid based on the quality and speed of its work, as well as the number of locals it trains, through a process called "full-delivery contracting."

EIBs and full-delivery contracting are two examples of a new approach to infrastructure development called "pay for success" (PFS) or "pay for performance" (P4P) – umbrella terms for government-led programs that incorporate performance metrics into the way they engage private-sector lenders and contractors.

The term "pay for success" formally originated in social services a decade ago, when the UK's Peterborough Prison launched the world's first Social Impact Bond (SIB) to finance a new approach to reducing recidivism.¹ The term "pay for performance" has been more common in the environmental space, where it's often used interchangeably with "pay for results" to identify climate-related payments for forest management that don't involve carbon offsets.² In ecological restoration, it's more recently come to describe both new mechanisms like EIBs and time-tested contracting practices that have been evolving for decades under different names.

The application of the terms in restoration was first summarized in two 2017 papers. One, "Nature: Paid on Delivery,"³ was published by the Environmental Policy Innovation Center (EPIC)⁴ and explained the concept in simple terms using concrete examples, some of which we revisit in these case studies. The other, "Pay for Performance Contract Mechanisms for Stormwater Management,"⁵ was published by Environmental Incentives⁶ and offers a theoretical framework for understanding P4P in ecological restoration.

Objective of this Document

Forest Trends' Ecosystem Marketplace⁷ produced this document for the US Department of Agriculture's (USDA's) Office of Environmental Markets (OEM) as part of a broader effort to create a geodatabase of P4P efforts across the United States. The database was created to map known P4P projects across the country. This document profiles seven programs identified in the database and offers brief snapshots of three additional projects.

This project is intended to build upon existing efforts, including the two papers cited above, to facilitate the development of additional data and decision support resources.

Defining the Term

Although the terms PFS and P4P are often used interchangeably, we have settled on the term P4P when describing the application of these methods to ecological restoration and PFS when describing their application to social services. This is not necessarily a formal distinction, but P4P appears to be the preferred term in ecological restoration and infrastructure improvement.

In a 2015 document focused on social services, PFS was defined as follows:

*[Pay for Success is] an innovative method of financing social services that shares risks and rewards through collaboration of public, private, and nonprofit sectors. PFS is based upon two core premises: first, that government should pay only for services that are demonstrably effective; and second, that the risk of providing social services – which may or may not prove to be effective – can be transferred from local and state governments that usually fund these services to the private sector. As in private-sector markets, the assumption of risk is rewarded or penalized in proportion to the degree of success attained.*⁸

The defining feature of all PFS and P4P projects is that they compensate private-sector participants – either investors or service providers – based on outcomes rather than activities, although the line can blur when proxies are utilized, as we shall see.

Within ecological restoration, Environmental Incentives breaks P4P into four strategies: Partial Pay for Performance, Project Seed Funding, Full Delivery, and Entrepreneurial Banking (the term they use for mitigation banking. See “Historical Roots of P4P in Mitigation Banking and In-Lieu Fee Permitting,” below). We exclude mitigation banking from our case studies because mitigation banks have already been extensively mapped in USDA’s EnviroAtlas. We divide the cases into two strategies: financing strategies, such as EIBs, and implementation strategies, such as full-delivery contracting.

The 2017 EPIC paper on P4P in ecological restoration includes the following definition:

Pay for success, or pay for performance, is an innovative approach to contracting that allows private investors to finance projects that are designed to meet a goal or target identified as a priority by a government agency. The government agency repays the private funder only after certain measurable outcomes are met. This can allow government agencies to engage in projects more effectively, efficiently and through innovative approaches.

This definition encompasses both financing strategies and implementation strategies.

Risk Sharing in Pay for Performance

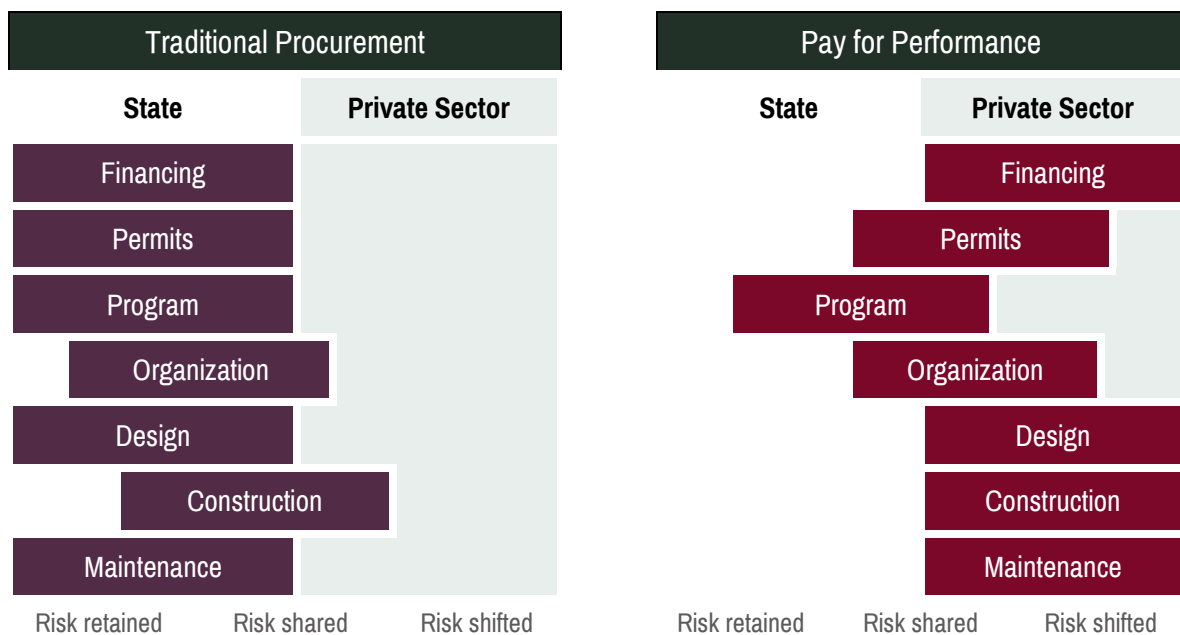
Government agencies utilize P4P to attract funding, accelerate project implementation, and manage risks such as cost overruns or failure to deliver. Private-sector providers utilize P4P to increase earnings by getting paid for beating deadlines, managing variables, and ensuring quality.

In this document, we explore two types of risk: finance risk and implementation risk.

Finance risk arises when governments attempt something new, such as expanding the use of untested green infrastructure improvements at the expense of time-tested “gray” infrastructure projects involving sewers, tunnels, and reservoirs. EIBs provide a means of sharing performance risk with investors, as we will see in Part II of this document.

Implementation risk is much broader, and Prince George’s County identifies seven categories of risk that are addressed through P4P and public-private partnerships (P3) more broadly.

Figure 1. Risks Transferred from the Public to the Private Sector through a Pay for Performance Model



Source: Adapted from Clean Water Partnership, 2020. <https://thecleanwaterpartnership.com/program-goals/>

Notes: Prince George’s County identifies seven kinds of risk that are transferred to the private sector via its P4P strategy.

Defining Characteristics of Pay for Performance

Although we use the EPIC definition presented on page 2 as our starting point, it is important to note that there is little consensus in the field among program administrators as to what constitutes P4P. Some administrators told Ecosystem Marketplace that the term should be applied with a narrow emphasis on structuring EIBs with payouts linked to verifiable outcomes. Others believe the term should encompass any ecological incentives offered to landowners.

In the end, we settled on the following criteria for inclusion in as a case study in this paper:

P4P Involves a Public Sector Mandate. Building on the history of pay-for-success in social services, where the mechanism is used to implement a public-sector objective, we focused on instances where government entities are utilizing P4P to improve either

the way they manage contracting for ecological improvement or the way they structure municipal bonds that have an ecological component. As a result, we focus on full-delivery contracting and environmental impact bonds, both of which we will define shortly. We also excluded mitigation banking, as noted earlier.

P4P Focuses on Outcomes, Not Activities. Traditional government contracting pays for distinct outputs, such as dredging a river or building a riparian buffer, while many government agri-environmental programs pay for activities, such as letting native grasses grow. P4P, however, must result in quantifiable, verifiable outcomes over a set period of time. This would ideally be an ecological improvement, such as cleaner water, but it can also apply to the building of buffers if payments are shifted from set payments to conditional payments based on performance.

P4P Entails Private Sector Risk-Sharing. Traditional government contracting is conducted on a “design-bid-build” basis, with payments for distinct services rendered and little liability for failure except in cases of negligence or criminal activity. Likewise, traditional municipal bonds pay a set rate of interest. With full-delivery contracting, however, complete payment is not exchanged until a performance level is met or exceeded, which means private-sectors must put money into the project prior to the payment and assume any financing risk therein. With EIBs, the investor’s rate of return is contingent in part on how well the ecological benefits are delivered.

Qualifying Criteria and Methodology

In gathering these specific case studies, we looked for projects that contained the above characteristics and met the following criteria:

- **Projects Offer New Insights.** We sought projects that either hadn’t been profoundly and objectively analyzed in peer-reviewed literature, consulting reports, and/or media, or that had evolved substantially since being studied. We excluded both mitigation banks, which have already been documented and mapped, and longstanding programs like the Electric Power Research Institute’s (EPRI’s) water quality initiatives in the Ohio River Basin, but we did include two EIBs that have received substantial academic and media coverage because they are the only two such initiatives up and running.
- **Projects are Operational or In Final Planning.** We found an abundance of projects and programs in various stages of design, but we wanted to focus on projects that were either up and running or had progressed far enough to offer useful lessons.
- **Projects are Diverse.** We looked for projects that were diverse enough to illustrate the spectrum of strategies currently being deployed within the above criteria, and we took great pains to look beyond our known universe of mitigation banking, which Ecosystem Marketplace has covered extensively. In the end, however, all but the EIBs were influenced by the mitigation banking sector, and most had been at least partially documented in the EPIC or Environmental Incentives reports previously mentioned.

To identify case studies, we first reached out via word-of-mouth through our existing networks and industry organizations, such as the Ecological Restoration Business Association. Through this process, we identified all of the projects we eventually included in this report.

We also contacted every state and territorial health and environmental agency listed on the federal EPA's web site.⁹ Through this process, we identified several programs that incentivize ecological restoration through innovative financing mechanisms but did not meet our criteria. Many, for example, paid landowners to implement actions on their land, and one incentivized restoration by absolving developers from certain liabilities if they were willing to restore dangerously degraded lands. None, however, imposed public-sector risk on private-sector providers.

Programs meeting our defining criteria were concentrated in a) areas like the Chesapeake Bay Watershed, which we will see operates under a federal mandate to reduce runoff that lends itself to the creation of an environmental currency, or b) in states where individual administrators had consciously decided to outsource the management of critical programs.

After identifying our projects, we conducted interviews with more than 30 individuals representing eight contracting agencies, nine service providers, and three independent consultants over a period of three months.¹⁰

The interviews themselves were wide-ranging and project-specific. In each full-delivery case study we interviewed both providers and contracting agencies, while for the EIBs we interviewed both the project designers and the municipalities raising funds. We did not use a standard questionnaire but rather developed specific questions based on project documentation built around five themes:

1. The impetus for utilizing P4P;
2. The challenges to implementing P4P;
3. The selection of a performance metric;
4. How risk was shared; and
5. Whether objectives were achieved.

All interviewees were given an opportunity to review the case studies for accuracy and completeness.

Box 1. Historical Roots of P4P in Mitigation Banking and In-Lieu Fee Permitting

Although there is a dearth of peer-reviewed literature on P4P in ecological restoration, there is substantial literature on three analogous mechanisms: namely, payments for ecosystem services, such as the use of carbon finance to save or restore forests, and the twin mechanisms of mitigation banking and in-lieu fee mitigation (ILF); the latter overlaps with some of our case studies.

Mitigation banking and ILF evolved over several decades as ways for private-sector developers and government agencies to meet regulatory requirements under the Clean Water Act (CWA) and the Endangered Species Act (ESA). Each of these laws sets out conditions for developers to receive permits for projects that adversely impact protected resources – waterbodies in the case of the CWA and habitat in the case of the ESA – but only if they offset their damages by preserving, enhancing, restoring, or creating assets of equal or greater environmental value in the same ecosystem. This principle of “no net loss” of ecosystem values creates a regulatory driver for mitigation banking and ILFs. That has in turn led to the creation of measurable units of impact that lend themselves to semi-standardized offset payments.

Such offsetting, or compensation, is only permitted after a process that follows the “mitigation hierarchy,” which is a sequence of decisions traditionally summarized as “avoid, mitigate, restore or rehabilitate and finally offset or, failing that, compensate.”¹¹ This means that developers must first seek to avoid impacts to protected areas, then keep any impacts to a minimum (mitigate them), then restore or rehabilitate areas that they degrade, and finally – as a last resort – offset any residual damages that remain after the first three steps by restoring equivalent degraded lands or compensating for damages financially.

The federal Environmental Protection Agency (EPA) and US Army Corps of Engineers (USACE) define a mitigation bank as “a site where wetlands and/or other aquatic resources are restored, created, enhanced, or in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources.”¹²

The US Fish and Wildlife Service defines ILF mitigation as a situation “where a permittee provides funds to an in-lieu-fee sponsor instead of either completing project-specific mitigation or purchasing credits from a mitigation bank approved under the Banking Guidance.”¹³

The regulations developed under the CWA and ESA also allow permittees to develop their own restoration projects, known as “permittee-responsible mitigation” (PRM), but this practice has fallen out of favor due to quality concerns. Specifically, over time it became clear that PRM tended to result in the creation of isolated ponds or patches of habitat with little ecological value, while mitigation banking and ILF mitigation projects tended to be larger and thus more likely to result in contiguous wetlands or habitat with greater ecological function. As a result, in 2008, regulators explicitly recognized mitigation banking and ILF mitigation as preferable to PRM.¹⁴

Ten years after regulators established that preference, environmental scientists Palmer Hough and Rachel Harrington analyzed USACE's RIBITS database and found clear evidence that costs are substantially lower in mitigation banking and in-lieu fee permitting for wetlands compared to PRM, but that further analysis is needed to determine whether quality improves as proponents contend.¹⁵

Table 1. Pay for Performance Projects Profiled in this Report

PROJECT	North Carolina Division of Mitigation Services	Bois d’Arc Lake	Louisiana Coastal Restoration Protection Authority	Anne Arundel County	Clean Water Partnership	Washington DC EIB	Atlanta EIB
TYPE OF PROJECT	Full-delivery contract	Full-delivery contract	Full-delivery contract	Multiple full-delivery contracts across county	Full-delivery contract	Environmental Impact Bond	Environmental Impact Bond
STATUS	Actively contracting	Actively contracting	Active, but no contracts	Actively contracting	Actively contracting	Fully funded	Partially funded
DOMAIN	Wetlands, stream, riparian buffers	Wetlands, forested wetlands, streams	Marshland restoration and enhancement	Stormwater runoff reduction	Stormwater runoff reduction	Stormwater runoff reduction	Expansion of green infrastructure
DRIVERS OF DEMAND	State and federal mitigation requirements	State and federal mitigation requirements	Coastal protection against rising seas	Reduction of impermeable surfaces associated with stormwater runoff	Reduction of impermeable surfaces associated with stormwater runoff	Reduction of impermeable surfaces associated with stormwater runoff	Reduction of impermeable surfaces associated with flooding
CONTRACTED INTERVENTIONS	Wetland restoration, Stream restoration, Riparian buffer restoration	Wetland restoration, Forested wetland restoration, Stream restoration, Riparian buffer restoration	Dredging, building marshland with fill	Reduction of impervious surface	Installation of green infrastructure across county with distinct social components	Expansion of green infrastructure	Expansion of green infrastructure

Table 1 [continued]. Pay for Performance Projects Profiled in this Report

PROJECT	North Carolina Division of Mitigation Services	Bois d’Arc Lake	Louisiana Coastal Restoration Protection Authority	Anne Arundel County	Clean Water Partnership	Washington DC EIB	Atlanta EIB
REPORTED BENEFITS OF A P4P APPROACH	Reduced cost and administrative burden to state, especially regarding land acquisition	Reduced administrative burden to contracting agency	Speed of delivery, possible reduction of costs and assurance of long-term viability	Reduced administrative burden, increased speed of implementation, reduced costs	Reduced administrative burden, increased speed of implementation, addition to local economy	Ability to link investor returns to environmental performance	Ability to link investor returns to environmental performance
STRUCTURE OF PERFORMANCE COMPONENTS	All payments are based on milestones, and 25 percent are based on post-construction performance	All payments are based on milestones, and between 23 and 45 percent are based on post-construction performance	All payments are based on milestones or post-construction performance, with clawback provisions if improvements fail at higher than threshold rates over time	All payments are based on milestones, with varying rates of payments based on post-construction performance	All payments are based on milestones, with varying rates based on post-construction performance and others tied to a long-term maintenance contract	Higher payout to investors in form of bonus if benefits of green infrastructure exceed expectations; clawback if expectations are not met	Higher payout to investors in form of bonus if benefits of green infrastructure exceed expectations
DEGREE OF SELLER CONTROL	Seller creates and implements mitigation plan, with broad leeway to make changes in cooperation with buyer	Seller creates and implements mitigation plan, with broad leeway to make changes in cooperation with buyer	Unknown: No contract has been awarded	Seller creates and implements mitigation plan, with broad leeway to make changes in cooperation with buyer	Seller creates and implements mitigation plan, with broad leeway to make changes in cooperation with buyer	Not applicable	Not applicable

Part I: Full-Delivery Contracting

Full-delivery contracting was spearheaded by mitigation bankers who are accustomed to taking more risk than design-bid-build contractors, but also to having more control. From the perspective of a contracting agency, full-delivery contracting eases administrative burden on public employees because it involves just one agreement with one provider, and because that provider shares the risk of failure.

Common Roles and Responsibilities in Full-Delivery Contracting

Every agreement must provide a clear breakdown of the rights and responsibilities of the parties involved. Here are some of the common actors identified in agreements:

1. Every contract designates a **governing entity** that oversees the program and either resolves disputes or establishes a means of doing so. The governing entity can be governmental or non-governmental, but even nongovernmental organizations (NGOs) are government-sanctioned.
2. Contracts will often designate a **project designer or proponent**, which is the person or entity with the standing to design a project. This can be an individual land manager, a commercial developer, and NGO, or the contracting agency itself.
3. Contracts will also specify a **third-party project certifier**, as well as the authority or certification under which the certifier is recognized.
4. It is also common for contracts to designate a **contracting officer**, which is the person who ensures a degree of consistency across all projects contracted. This person is charged with reviewing procurement packages, approving amendments, and any other responsibilities designated in the contract.

For a more detailed examination of the parties to a full-delivery contract, see the “Participants & Components of Pay for Success” section in “Pay for Performance Contract Mechanisms for Stormwater Management.”¹⁶

North Carolina: The ILF Clearing House

The North Carolina Department of Environmental Quality (DEQ) administers the most extensive full-delivery ecological restoration program in the United States through its Division of Mitigation Services (DMS). The division traces its genesis to the mid-1990s, and the story of its decades-long evolution from a classic design-bid-build program to one built on full-delivery and pay for performance is a story of risk, responsibility, and adaptation.

Highlights

- DMS administrators developed a preference for full-delivery contracting over more than 20 years, in part because of reduced administrative burden.
- DMS sees the full-delivery service provider's management of land acquisition as a key value-add.
- DMS carries market risk, but providers carry performance risk.

Overview

DMS launched in 1997 as the Wetlands Restoration Program (WRP), with a mission to provide cost-effective mitigation alternatives to improve North Carolina's water resources. DMS achieves this by acting as a clearinghouse - a buyer to every seller and seller to every buyer - for a massive ILF program. Specifically, it collects mitigation fees from land developers, including the North Carolina Department of Transportation (NC DOT), that need to either reduce their net nutrient runoff or mitigate their impacts on streams, wetlands, and riparian buffers as a result of permit requirements. It then aggregates those fees and then contracts ecological restoration, primarily on a full-delivery basis, with providers of mitigation restoration.

In the decades since WRP was launched, the program has developed a blend of strategies designed to offer price certainty to permittees, market certainty to providers, ecological certainty to regulators, and administrative efficiency to its operations.

DMS reduces market risk by offering permittees an opportunity to purchase mitigation at a set price and offering contractors, many of whom are also mitigation bankers, a guaranteed market by contracting for mitigation ten years into the future. It has worked closely with the US Army Corps of Engineers (USACE), the US Environmental Protection Agency (US EPA), and other state and federal agencies to develop coherent parameters of success, and the shift to full-delivery pay-for-performance contracting has enabled the agency to streamline its contracting process while off-laying ecological and implementation risk to private-sector providers.

Since its inception, DMS has placed more than 79,670 acres in conservation easements and three million feet of stream.¹⁷ It executed 47 easement transactions in fiscal 2018-2019 alone.¹⁸

The Four Buckets

DMS currently operates four ILF programs. One provides mitigation to NC DOT on a continuing cost basis, and the other three provide mitigation according to published, set fee schedules.¹⁹

Continuing Cost Basis

The NC DOT Stream/Wetland Program works with NC DOT to mitigate stream and wetland impacts from future road construction. Under an agreement between the two agencies, NC

DOT regularly provides DMS with a list of planned infrastructure projects seven years into the future, which makes it possible for DMS to begin contracting for future mitigation needs. DMS then supplies the mitigation by contracting with suppliers on a full-delivery, pay-for-performance basis and billing NC DOT regularly as costs accrue.

Up-Front Set Price

The other three programs work with all other applicants, both governmental and private, depending on the mitigation need. Once a project requiring mitigation is approved, the applicant can satisfy its mitigation requirement by making a payment to DMS under published fee schedules. The three programs are:

- **The Statewide Stream/Wetland Program**
- **The Riparian Buffer Program**
- **The Nutrient Offset Program**

Each Program operates its own segregated account, but DMS has some flexibility to transfer same-type credits between the four buckets in response to shifting demand. This improves efficiency by making it possible to finance larger projects early, which locks in lower prices, while reducing the chances of being stuck with stranded assets if demand fails to materialize.

Risk-Sharing and Payment Schedule

The model has been successful in ensuring demand because it shifts demand risk to the public sector, lowers transaction costs and credit costs, and makes permitting more predictable for buyers. It matches risks to strengths: the private sector carries implementation risk and most of the financing risk (though NC DOT provided initial program capital), while the public sector takes on the burden of accurately predicting demand and ensuring a pipeline of approved credits.

DMS shares risk with providers by offering some payments upfront but withholding most until after the project is completed and verified (Task 6, shown on page 13 in Table 2). It requires a performance bond up to verification but none afterwards. The final 25 percent of payment is paid out in yearly increments over seven years after verification, contingent on successful credit release and other criteria that varies from project to project.

DMS can withhold payments if the project fails to meet any success criteria or if credits are perceived to be “at risk,” which can happen if the Army Corps of Engineers or another member of the Interagency Review Team calls them into question. In such cases, DMS may work with the provider to develop a contingency plan.

Table 2. North Carolina Division of Mitigation Services Project Milestones and Payment Schedule for Full-Delivery Contracting

TASK	PROJECT MILESTONE	PAYMENT (PERCENT OF CONTRACT VALUE)
1	Regulatory Site Visit & Environmental Screening	5%
2	Submit Recorded Conservation Easement on the Site	20%
3	Mitigation Plan (Final Draft) and Financial Assurance	15%
4	Mitigation Site Earthwork completed	15%
5	Mitigation Site Planting and Installation of Monitoring Devices	10%
6	Baseline Monitoring Report (including As-Built Drawings)	10%
7	Submit Monitoring Report #1 to DMS (meets success criteria)	5%
8	Submit Monitoring Report #2 to DMS (meets success criteria)	2%
9	Submit Monitoring Report #3 to DMS (meets success criteria)	2%
10	Submit Monitoring Report #4 to DMS (meets success criteria)	2%
11	Submit Monitoring Report #5 to DMS (meets success criteria)	2%
12	Submit Monitoring Report #6 to DMS (meets success criteria)	2%
13	Submit Monitoring Report #7 to DMS and complete project Close- Out process (meets success criteria)	10%
	TOTAL	100%

History

In the early 1990s, most permittees were still conducting their own mitigation, but environmental NGOs were becoming increasingly critical of PRM for producing projects of low quality - often resulting in the creation of isolated ponds instead of wetland systems that delivering hydrological services. The North Carolina General Assembly responded in 1996 with legislation forming WRP to develop and coordinate a systemic wetland management strategy. WRP formally launched in 1997 as a program within the Department of Environment and Natural Resources (DENR, now DEQ), and was recognized by USACE in 1998.

Its mandate then was the same as DMS's is now. Namely, it was charged with collecting in-lieu fees from permittees, aggregating them, and then using the money to finance mitigation activities. It worked primarily on a design-bid-build basis, which involved identifying and acquiring mitigation sites and then contracting out the design and restoration activities.²⁰

The First Overhaul

At its creation, WRP operated parallel to NC DOT's own PRM activities, meaning the state ran two separate mitigation programs, while mitigation banking operated in a third stream. A wide number of participants – from environmental NGOs to mitigation suppliers to federal and state regulators – argued that the system lacked cohesion. In response, the state convened nearly a dozen state and federal agencies, as well as environmental NGOs and private sector participants, to review the state's mitigation practices.

This resulted in a 2003 tri-party agreement among NC DOT, DENR, and USACE to blend WRP and NC DOT's program into a new entity, the Ecosystem Enhancement Program (EEP).²¹ Under the agreement, NC DOT utilized EEP as its primary provider of mitigation, and it compensated EEP through regular payments tied to underlying costs. This gave EEP two distinct income streams: one from NC DOT and one from permittees that carried some price risk. EEP also took responsibility for producing biennial budgets reflecting the projected quarterly costs of running the NC DOT program, with the budget being approved annually by the NC Board of Transportation.

The Shift to Full-Delivery

EEP continued to develop mitigation projects on a design-bid-build basis, but it occasionally turned to mitigation bankers as its workload increased. Current and former staff say that a preference for full-delivery quickly emerged, but that there were several obstacles to implementing it.

The chief advantage came in the fact that each project required just one contract instead of separate contracts – each governed by strict procurement guidelines – for design, construction, monitoring, and maintenance. From an administrative perspective, the task of developing more and more projects, each involving multiple vendors on an increasing number of sites, wasn't just unwieldy but increased the risk of something going wrong. A heavy contract administration workload also distracted from EEP's strategic planning function.

Land acquisition was especially burdensome, for two reasons. First, government procurement guidelines make it difficult for state agencies to rapidly acquire private land. Second, the process of identifying and acquiring land requires localized knowledge that government agencies often lack.

Shifting to full delivery also faced challenges. Among these was reticence on the part of some inside EEP to cede control over project management to outside entities, but a larger issue was that procurement agencies were ill-equipped to "purchase" ecological restoration, having evolved to manage purchases of commoditized materials and construction outputs. This meant that, as its own internal comfort grew, EEP also had to campaign for guidelines to be amended and for procurement officers to be trained in valuing ecosystem services.

Internally, staff members came to see full-delivery contracting as a means of freeing up time to focus on the core functions of planning and coordination, and by 2005 full-delivery accounted for roughly half of EEP's acquisitions. By 2008, EEP had developed a clear preference for full-delivery over design-bid-build, and the procurement process had evolved to meet that preference.

Full-delivery became the official practice of choice in 2010, after EEP negotiated the creation of a new ILF instrument with USACE and other federal and state regulators.²² In 2011, the 1996 legislation authorizing WRP and, thus, EEP was amended to explicitly mandate that EEP "first seek to meet compensatory mitigation procurement requirements through the... full delivery

program or by the purchase of credits from a private compensatory mitigation bank,²³ with design-bid-build being a last resort.

In 2015, EEP became a division within DEQ and changed its name to DMS to stress its role as a provider of mitigation services, and the law was then updated accordingly.

How it Works: Determining Fees

DMS's ILF program offers price certainty to permittees by publishing set fees for all mitigation services at the beginning of each year, although the Buffer and Nutrient offset may change quarterly under some conditions. It establishes fees through an analysis of the most recent three years of transaction data from both the full-delivery and mitigation banking sectors, as well as known current prices and projected future prices, plus overhead costs.

NC DOT pays the actual cost of mitigation based on transportation plans and forecasted mitigation needs over the next seven years, combined with average annual payments of the preceding seven years. It provides a process for DMS to submit regular invoices, either monthly or quarterly.

ILF Rates for Fiscal 2018-2019

DMS posts its annual rate schedules at <https://deq.nc.gov/about/divisions/mitigation-services/dms-customers/fee-schedules>. Its ILF program competes with mitigation banks, but it also utilizes them and contracts restoration with companies that also provide mitigation banking services. The chart below shows the prices that EEP pays for mitigation credits and the prices it charges.

Table 3. North Carolina Division of Mitigation Services In-Lieu Fee Rates, 2018-19

CREDIT TYPE	RANGE OF PROGRAM COSTS PER CREDIT	FEE CHARGED
Stream	\$275 to \$490	\$558.81
Freshwater Wetland	\$29,500 to \$106,400	\$61,264.36 to \$144,876.09
Coastal Marsh Wetland	N/A*	\$560,000.00
Riparian Buffer	\$0.73 to \$3.28	\$0.94 to \$4.00
Nutrient Offset Nitrogen	\$89.00	\$9.24 to \$107.88
Nutrient Offset Phosphorus	N/A*	\$130.83 to \$301.95

Notes: In its ILF program, DMS collects fees and uses the money to pay for mitigation. The range of program costs per credit shows what EEP pays its full-delivery providers, while the current fees are what it charges permittees.

Mitigation Bank Rates for Fiscal 2018-2019

Before contracting with a full-delivery provider, DMS will try to cover its mitigation needs with existing mitigation bank credits. As a result, it routinely requests credit prices from mitigation banks, which include market risk. Such credits are usually priced higher than DMS can achieve

through full-delivery contracting and are thus rarely used. Mitigation bank prices for fiscal 2018-2019 are presented in Table 4.

Table 4. Mitigation Bank Credit Prices Quoted to North Carolina Division of Mitigation Services, 2018-19

MITIGATION TYPE	RANGE OF BANK PRICES PER CREDIT
Stream Mitigation Credits	\$425 to \$690
Riparian Wetland Mitigation Credits	\$41,819 to \$91,969
Non-Riparian Wetland Mitigation Credits	\$40,000 to \$75,000
Coastal Marsh Mitigation Credits	None Submitted
Riparian Buffer Mitigation Credits	\$0.75 to \$3.50
Nitrogen Offset Credits	\$6.78 to \$180.00
Phosphorus Offset Credits	\$96.00 to \$350.00

The Solicitation Process

When DMS issues its requests for proposals (RFP)s, it asks providers to submit two separate proposals: one containing a technical proposal and one containing a pricing proposal.

Once the technical review is complete, the pricing plans of those envelopes of prices of those proposals that pass the technical review are also opened publicly and the total cost is tabulated and entered into the public record.

At their sole option, the evaluators may request oral presentations or discussions with any or all providers for the purpose of clarification or to amplify the materials presented in any part of the proposal. Vendors are cautioned, however, that the evaluators are not required to request presentations or other clarification – and often do not. Therefore, all proposals must be complete and reflect the most favorable terms available from the provider.

Box 2. Anatomy of a Project: Lake Wendell

In June of 2015, DMS put out a “free solicitation” – or advance notice of an impending RFP – related to stream restoration in the Neuse River Basin. Such notices are designed to spark competition among full-delivery providers, and this one activated Rolodexes across the basin as providers started reaching out to their networks of landowners to see who might still be interested in selling.

In July of 2015, the official RFP came out, and it was a big one: for 120,000 linear feet of restored stream.

Raleigh-based Water & Land Solutions (WLS) was one of many to respond, and they did so for two primary reasons: first, the solicitation was large enough that they knew they’d have a reasonable chance of winning part of it, and second, they already had a line on three parcels of severely degraded land that would deliver a high ecological benefit if restored – a critical criterion for establishing additionality.

One of the landowners was a family that had been raising cattle along the edges of Lake Wendell for generations, and a century of hooved animals had turned 3,000 feet of stream into a muddy pasture with a shallow pond in the middle. Restoration would require taking the land out of production forever, but the family’s priorities were changing over time.

Restoration would mean taking the land out of production forever, but the family’s priorities were changing over time. They still lived off the land, but they liked the idea of seeing the muddy pasture returned to its natural state – both for downstream users and for future generations. The same family had already worked with WLS to restore three other parcels when the company was just getting started, and the relationship had turned into a true partnership for transforming the land into something of value to both nature and future generations of the family. They were even working with WLS on a hypothetical plan for one of their parcels that was closer to Raleigh and could be valuable to future generations as a development property. For that reason, they were preemptively marking out the routes easements could take there while leaving room for development.

Likewise, they’d discussed the current degraded stream as well, and they’d worked out a tentative proposal that would involve cash payments and support for other parts of the farm, but now there was a real proposal in the works.

After a family meeting, they decided to accept an option on the land, and WLS began work on a detailed, 110-page technical proposal for restoration that included an inventory of the soils on the land, a map of the stream, a description of the work needed, examples of previous jobs done well, and a summary of downstream ecological benefits. The ecological benefits were clear, and the proposal to restore 3,381 linear feet of stream breezed through the technical round of DMS’s approval process with a high technical score.

In the second phase, DMS compared all of the proposals that had passed the technical phase and weighed the costs against the benefits. In March of 2016, the Lake Wendell Mitigation Project was one of several to be contracted.

Bois d’Arc Lake: Going Big on Full-Delivery

When the North Texas Municipal Water District launched operations in 1956, it provided service to 32,000 people. Today, it’s serving 1.8 million people and growing. To meet demand, the District is building its first new reservoir in more than 25 years: a 16,641-acre man-made reservoir called Bois d’Arc Lake.

After considering multiple options, the District chose to mitigate its impact through a \$135 million (M) full-delivery project that is scheduled to finish construction in 2022. Monitoring of the mitigation site will continue through 2040.

Highlights

- The largest single full-delivery project in the United States to-date is broken into dozens of smaller restoration parcels.
- The contracting agency, the North Texas Municipal Water District, chose a full-delivery route to unload administrative burden and risk.
- Unlike most other full-delivery programs, land acquisition is not seen as a private-sector value-add.

Overview

Once completed, Bois d’Arc Lake will provide 108 million gallons of potable water per day while also acting as a sport and recreation area. It’s projected to generate \$166M in economic activity annually,²⁴ but it will also flood nearly 17,000 acres of forest, wetland, and meadow. To mitigate that impact, the District asked the lake’s engineering contractor, Freese and Nichols, to develop a mitigation plan more than a decade ago. Regulators approved the plan in 2017, and the District issued an RFP in 2018. It selected Resource Environmental Solutions (RES) to develop the Bois d’Arc Lake Permittee Responsible Mitigation Project on a full-delivery basis.

RES is providing full project management, including design, construction and monitoring over three sites: the Riverby Ranch, which the District purchased in 2004, the Upper Bois d’Arc Creek mitigation site, which the district is in the process of acquiring, and a smaller restoration area adjacent to Riverby Ranch that RES purchased and deeded to the District after learning that more mitigation was needed.

The project includes multiple payment benchmarks covering a diverse array of restoration activities, each broken down by ecological unit. It will ultimately restore 8,500 acres of wetland, 2,500 acres of herbaceous wetland, 3,000 acres of native grassland, and 369,000 linear feet (70 miles) of stream while planting more than five million trees.

Risk Sharing

The contract was designed to strike a balance between up-front payments and longer-term performance payments, and there are different total payments for each of several hundred mitigation units being delivered. The District paid RES 5 percent of the relevant payment upon approval of the designs, and then it paid 5 percent when RES moved its equipment into place (mobilization). The District also paid RES a lump sum for the small amount of land it had to acquire, but all other payments were based on the delivery of ecological units and other benchmarks.

RES was required to cover its liability with insurance and a performance bond, which is common in full-delivery contracting and mitigation banking but not in design-bid-build contracting.

Land Previously Owned by the District

The bulk of the restoration and recovery takes place on land the District already owned, so there is no payment for land acquisition. Instead, there is a higher payment for project completion and growing season benchmarks, as Table 5 below illustrates.

Table 5. Example Performance Milestones and Payment Schedule for Bois d’Arc Lake Pay for Performance Contract, Land Previously Owned by North Texas Municipal Water District

ITEM NO.		102	105	151
LOCATION (CATEGORY)		Riverby (aquatic)	Riverby (aquatic)	Riverby (terrestrial)
COVER TYPE		Forested wetland – restoration	Scrub shrub wetland – restoration	Native grassland - restoration
PERCENT OF TOTAL PAYMENT AWARDED AT MILESTONE	Mobilization	5%	5%	5%
	Design (Approved construction documents)	5%	5%	5%
	Completion Milestone (approved as-built[s] paid per completed line item)	50%	50%	50%
	Three growing seasons – Performance standard (per line item)	20%	25%	0%
	Five growing seasons – Performance standard (per line item)	0%	15%	40%
	Ten growing seasons – Performance standard (per line item)	10%	0%	0%
	Twenty growing seasons – Performance standard (per line item)	10%	0%	0%
		100%	100%	100%

Source: RES.

Notes: This table is excerpted from a larger payment schedule.

Land Purchased by RES and Deeded to the District

Table 6 is an excerpt from the payment schedule, showing two land cover types on land secured by RES and deeded to the District. RES received 40 percent of the amount agreed on for the relevant ecological units when it deeded the land to the District, 5 percent when its designs were approved, and 5 percent when it began operations. Beyond that, 27 percent was contingent on the delivery of ecological units, such as acres of wetland or feet of stream. Once a unit is verified, the monitoring period for that unit begins.

To summarize: 27 percent is payable when construction is complete and as-builts are submitted; 17 percent is payable once ecological performance standards are met.

Table 6. Example Performance Milestones and Payment Schedule for Bois d’Arc Lake Pay for Performance Contract, Land Purchased by RES and Deeded to the North Texas Municipal Water District

ITEM NO.		108	109	110
LOCATION (CATEGORY)		RES property (aquatic)	RES property (aquatic)	RES property (aquatic)
COVER TYPE		Forested wetland - enhancement	Emergent wetland – enhancement	Emergent wetland - restoration
PERCENT OF TOTAL PAYMENT AWARDED AT MILESTONE	Mobilization	5%	5%	5%
	Land	40%	40%	40%
	Design (Approved construction documents)	5%	5%	5%
	Completion Milestone (approved as-built[s] paid per completed line item)	27%	27%	27%
	Three growing seasons – Performance standard (per line item)	0%	14%	14%
	Five growing seasons – Performance standard (per line item)	0%	9%	9%
	Ten growing seasons – Performance standard (per line item)	17%	0%	0%
	Twenty growing seasons – Performance standard (per line item)	6%	0%	0%
		100%	100%	100%

Source: RES.

Notes: This table is excerpted from a larger payment schedule.

History

The District had anticipated the need for a new reservoir as far back as the 1970s, and it began taking steps to develop a mitigation strategy in the 1990s, both to meet its own internal environmental guidance and to secure permits from federal regulators under the Clean Water Act and the National Environmental Policy Act (NEPA), as well as a state permit from the Texas Commission on Environment Quality (TCEQ). In 2004, the District learned that the 15,000-acre Riverby Ranch was for sale and acquired the property for \$35M with the intent of developing its own PRM.

In 2006, the District engaged Freese and Nichols to develop a mitigation plan, initiating a ten-year period of public consultation, review, and revision. As the mitigation plan and permitting process evolved, the District explored the use of a Construction Manager at Risk (CMR) delivery method, which encourages cooperation between the construction and design firms and involves a guaranteed price range.

CMR is the method the District initially used on the reservoir construction, but in 2015 it shifted to full-delivery contracting for three reasons:

1. **Core Competency:** CMR still required significant oversight on the part of the contracting agency, which the District feared would bring it into the field of ecological restoration and outside its core competency of water provision.
2. **Project Management:** On a related note, project oversight would entail the management of several interrelated contracts with multiple vendors, increasing both risk and administrative burden.
3. **Long-Term Risk:** Some of the permits came with credit release schedules stretching 20 years into the future, and none of the contractors the District worked with were willing to stand behind a project that long.

Mitigation Plan as Shopping List: The Iterative Implementation

Once they decided to utilize full-delivery contracting, the District asked Freese and Nichols to develop a streamlined mitigation plan that would likely be approved by USACE but that left enough flexibility for bidders to develop their own designs.²⁵ This had the added benefit of giving contractors the flexibility to amend designs during the construction phase without returning USACE for permission to amend the plans. In addition to submitting an overall bid, responders were asked to fill out an itemized price list corresponding to credits generated on different parcels of land, broken down by cover type and localized geography. (See "Price Proposal Form 2").

Before settling on full-delivery, the District had developed a more detailed mitigation plan that it shared with potential mitigation providers, but the companies had leeway to develop their own strategy, provided it met the criteria of the approved plan. However, the District made it clear in the RFP process it expected the selected mitigation provider to develop designs in coordination with the District and their consultants.

Once RES was selected, the program entered an initial design process that took roughly a year. During this period, RES first submitting a conceptual design that the District reviewed and approved, then a more detailed preliminary design, and then a final design that RES was still encouraged to amend as construction progressed.

Figure 2. Price Proposal Form Completed by Contractors Bidding for the Bois d'Arc Lake Full-Delivery Contract

Price Proposal Form 2

Proposer shall complete each line item with a "\$" to reflect the level of effort for each cover type or stream work. This Form will be used for determining payments to the Full-Service Provider. This table will be subject to negotiations if Owner believes it is unbalanced or unreasonable.

Bid Table (For Payment Purposes Only)							
Lower Bois d'Arc Creek Reservoir (LBCR) Mitigation							
Item No.	Location (category)	Cover Type	Acres	Feet	Unit	Quantity	Extended Amount (\$)
101	Riverby (aquatic)	Forested Wetland - Enhancement	452	N/A	lump sum	1	\$
102	Riverby (aquatic)	Forested Wetland - Restoration	3,675	N/A	lump sum	1	\$
103	Riverby (aquatic)	Emergent Wetland - Enhancement	1,190	N/A	lump sum	1	\$
104	Riverby (aquatic)	Emergent Wetland - Restoration	1,287	N/A	lump sum	1	\$
105	Riverby (aquatic)	Scrub Shrub Wetland - Restoration	150	N/A	lump sum	1	\$
106	Riverby (aquatic)	Streams - Restoration, Enhancement, Creation	N/A	211,950	lump sum	1	\$
107	Riverby WRP (aquatic)	Streams - Enhancement	N/A	94,596	lump sum	1	\$
151	Riverby (terrestrial)	Native Grassland - Restoration	2,445	N/A	lump sum	1	\$
152	Riverby (terrestrial)	Upland Forest - Enhancement	78	N/A	lump sum	1	\$
153	Riverby (terrestrial)	Upland Forest - Restoration	1,027	N/A	lump sum	1	\$
154	Riverby (terrestrial)	Riparian Woodland - Enhancement	840	N/A	lump sum	1	\$
155	Riverby (terrestrial)	Riparian Woodland - Restoration	535	N/A	lump sum	1	\$
171	Riverby Preservation	Lacustrine/Open water	34	N/A			
172	Riverby Preservation	Shrub Wetland	98	N/A			
173	Riverby Preservation	Shrubland	41	N/A			
301	Upper Bois d'Arc (aquatic)	Forested Wetland - Enhancement	574	na	lump sum	1	\$
302	Upper Bois d'Arc (aquatic)	Forested Wetland - Restoration	1,100	na	lump sum	1	\$
303	Upper Bois d'Arc (aquatic)	Streams - Restoration/Enhancement	N/A	62,535	lump sum	1	\$
351	Upper Bois d'Arc (terrestrial)	Upland Forest - Enhancement	9	na	lump sum	1	\$
352	Upper Bois d'Arc (terrestrial)	Upland Forest - Restoration	119	na	lump sum	1	\$
				GRAND TOTAL	\$		

Notes: In addition to the overall bid, responders were asked to fill in a price list of specific anticipated ecological outcomes.

Solicitation and Contracting

In 2017, all permits were approved. In March 2018, the RFP was issued, with a budget of \$150M. Due to its size, only three bids were submitted, and all were graded according to the criteria presented in Table 7.

Table 7. North Texas Municipal Water District’s Evaluation Criteria for Selecting Full-Delivery Provider, Bois D’Arc Lake

EVALUATION CRITERIA	WEIGHT
Compliant Proposal Transmittal Letter; Financial information; Ability to provide bonds and insurance	Pass/Fail
Proposer and proposer team qualifications; Experience and key personnel	20%
Project approach – Design and construction	15%
Project approach – Monitoring and maintenance period	15%
Interview	10%
Price proposal	40%
	100%

RES was awarded the contract at \$129M, but the price increased to \$135M after additional mitigation needs were identified. This was still \$15M below the District’s budget, despite the fact that it included additional mitigation.

Louisiana: Next Generation – or Near Miss?

In 2018, Louisiana’s Coastal Restoration Protection Authority (CPRA) issued an RFP for a \$65M full-delivery marsh restoration project.

Four developers submitted proposals; one was identified as having both the best technical design and the best price. But CPRA ultimately rejected the proposal on the grounds that its own project management team could deliver the same restoration cheaper and at the same quality, albeit not as quickly. CPRA staff also expressed concern that private developers would incite a bidding war that would inflate the price of submerged land and disrupt the state’s overall pricing for marsh restoration.

Proponents of full-delivery contracting dispute many of CPRA’s conclusions. Some see the RFP as a lost opportunity – once that would have been a model for other initiatives and accelerated the deployment of billions of dollars in funding for coastal restoration while reducing costs and improving quality. This case study examines these areas of disagreement, as they provide insights into the challenges of utilizing full-delivery at a large scale.

Highlights

- No full-delivery contracts have yet been awarded, due to disagreements over projected savings.
- Potential costs and benefits of P4P are difficult to project due to the lack of a market price for an acre of improved marshland, disputes over long-term failure rates, and disagreements over the time value of money.
- The contracting agency does not see private-sector land acquisition as a value-add.

- The contracting agency believes that expanded borrowing rights will increase its access to outyear funds, thus reducing the cost of self-delivery.

Overview

Few states have a more urgent need for ecological restoration, or a more ambitious plan for delivering it, than Louisiana. The state's coastal areas are sinking into the sea as water levels rise, a result of natural subsidence, fossil fuel extraction, disrupted flows of sediment from the Mississippi River, and, of course, climate change. The government has embarked on a 50-year, \$50-billion (B) "Coastal Master Plan" that CPRA first published in 2007, with updates in 2012 and 2017. The 2017 plan describes 124 restoration projects covering 800 square miles of lost or endangered land.²⁶ CPRA says it will result in avoided damages of at least \$150B over time.

CPRA draws on multiple funding streams, most of which are recurring but insufficient and inconsistent. One exception materialized in 2016: \$8.7B from BP and other companies deemed responsible for the 2010 Deepwater Horizon oil spill.²⁷ That \$8.7B is being released intermittently over 15 years that began in 2017 and will end in 2031, primarily through two vehicles: the Deepwater Horizon (DWH) Natural Resource Damages (NRD) Fund and the National Fish and Wildlife Foundation's Gulf Environmental Benefit Fund (GEBF).

Previous Studies

In addition to our own interviews, we reference two third-party analyses, both of which are available online and both of which assume more prior knowledge than we do here. This case study is designed to complement previous analyses by placing them in the context of our other interviews.

The Environmental Policy Innovation Center Analysis

The Environmental Policy Innovation Center (EPIC) is a DC-based think tank headed by the former Associate Director for Conservation at the White House Council on Environmental Quality. It published a critique of CPRA's decision entitled "An Analysis of Outcome-Based Performance Contract Bids and the Coastal Protection and Restoration Authority's Response."²⁸ In the following section, we refer to this as the "EPIC Analysis."

The Royal Engineers & Consultants Summary

Royal Engineers & Consultants is a Louisiana-based engineering and consulting firm specializing in civil engineering, coastal services, project management, and disaster recovery. It provided a summary of post-mortem roundtable discussions that CPRA conducted with several participants in the project, including but not limited to all of the proposers. It summarized the recommendations in a publication entitled "Outcome Based Performance Contracting: Findings and Recommendations Report,"²⁹ which was presented at a CPRA board meeting in February 2020.³⁰ In the following section, we refer to this as the "Royal Engineers Summary."

Deepwater Horizon: the \$8.7 Billion Infusion

CPRA coordinates roughly \$1B per year for itself and other agencies. Its 2020 budget is \$1.08B, of which \$804M is allotted for 68 improvement projects.

Some of the money flows from fuel and recreation taxes, the oldest of which are associated with the Coastal Wetlands Planning, Protection and Restoration Act, a 1990 law that provides roughly \$75M per year to USACE, the National Oceanic and Atmospheric Administration, and other agencies working on Gulf Coast wetlands.

The largest current flows, however, come from a source that will stop delivering in 2031 – namely, the \$8.7B in civil and criminal awards associated with the Deepwater Horizon oil spill. That 2010 spill dumped 3.19 million barrels of oil into the Gulf of Mexico and decimated the coastal ecosystems (and economies) of Florida, Alabama, Mississippi, Louisiana, and Texas. Then-Attorney General Eric Holder launched civil and criminal proceedings against the company and its contractors, resulting in criminal fines and penalties of \$4B and a civil settlement of \$20.8B.

The total amount allotted for Louisiana’s coastal restoration efforts is \$8.7B. This is, as previously stated, being distributed in annual increments from 2017 to 2031 through several vehicles – the two largest being the DWH NRD Fund and the National Fish and Wildlife Foundation’s GEBF.

DWH NDR has allotted \$5B for Louisiana marsh restoration, but projects have been slow to move beyond the design phase. GEBF has allocated \$1.27B for barrier island restoration or sediment diversions from the Mississippi and Atchafalaya Rivers.

The DWH NRD is administered by 20 state and federal trustees through a complex bureaucracy that operates across all five impacted Gulf states under the Natural Resource Damage Assessment (NRDA). Within each state, the federal trustees are represented by Trustee Implementation Groups (TIGs). Within Louisiana, DWH NRD is administered jointly by CPRA and the Louisiana TIG.

The complex arrangement began taking shape in 2012, when the US Congress passed the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States (RESTORE) Act.³¹ This established the Gulf Coast Ecosystem Restoration Council (referred to here as the “Council”) and Gulf Coast Restoration Trust Fund (the “Trust Fund”) to administer any civil penalties associated with the suit.

Although the 2017 Coastal Master Plan came out after the settlement, the plan’s framework dates back to 2007. As a result, the funding is seen as a means to accelerate planning already underway.

Shifting to Full-Delivery

As the Deepwater Horizon settlement was taking shape, a broad array of dredgers, designers, and other contractors lobbied for new legislation that recognized full-delivery pay-for-performance contracting. The result was House Bill 596,³² which Governor John Bel Edwards signed into law in June 2017. The law authorized CPRA to award “outcome-based performance contracts” up to \$250 million each for coastal restoration projects in the state. Such contracts would have to be awarded through a competitive bidding process, and at least 75 percent of the payments had to be contingent on defined performance outcomes.

The law mandates a two-step solicitation process to solicit contractors. The first step involves a public Request for Statements of Interest and Qualifications (RSIQ) to identify companies with the technical and financial resources to finish the job and handle the risk. The second involves a project-specific RFP sent to qualified responders.

Six companies passed the first round; CPRA then prepared a detailed RFP for a marsh creation project within the Barataria Basin.

The RFP required the proposer to build marshes with out-of-system sediment dredged from “the Mississippi River, other federally authorized navigation channels, and from offshore beyond the depth of closure.” It also said responders were “responsible for the acquisition of all lands, easements, rights-of-way, oyster leases, relocations, servitudes, dredged material

disposal areas, and servitudes necessary for Project design, construction, maintenance and monitoring.”³³

These two provisions – one mandating the use of out-of-system borrowed fill and one placing responsibility for land rights acquisition on the responder – led some responders to negotiate land rights on degraded marshes near the dredging site to reduce the cost of transporting dredged material.

The Louisiana RFP was based in large part on similar RFPs utilized by North Carolina’s DMS. Like North Carolina, for example, the RFP required two submissions: one outlining the technical proposals, and one including the price.

Risk-Sharing and Payments

Under CPRA’s RFP, 65 percent of the payment comes after construction is completed, and another 28 comes in the ensuing five years. The project comes with a 20-year “warranty” that allows CPRA to claw back 100 percent of funds if more than 20 percent of the restored marshland fails. According to the EPIC Analysis, past non-full-delivery projects failed at a 48 percent rate, with funds paid out according to a fee schedule rather than milestones. Although the final payment is often contingent on inspection, there is no warranty or clawback.

In the payment schedule below, you can see that the most substantial payment comes at milestone three, when the project is finished to specification. This gives the developer an incentive to finish the project quickly, with yearly fees coming for five years afterward to ensure quality. The first four annual payments are contingent on the site meeting prescribed elevation and vegetation levels, and CPRA can withhold payments if the site is out of compliance. The agreement also contains provisions for payments to resume if the developer rectifies the problem.

The fifth and final payment, which amounts to 20 percent of the total, comes after the fill material has settled and modeling determines that 80 percent of the project will survive for 20 years. The modeling is to be provided by the developer but approved by CPRA.

Table 8. Payment Schedule, Louisiana Coastal Restoration Protection Authority’s Request for Proposals for Marsh Creation Projects in the Barataria Basin

MILESTONE PAYMENT DESCRIPTION	PERCENT OF TOTAL PAYMENT
1. Preliminary Design Report, Property Rights, Site Analyses, and Draft Monitoring Plan	2%
2. Final Design Report, Permits, Financials, and Final Monitoring Plan	5%
3. As-Built Drawings and Baseline Monitoring Report	65%
4. Monitoring Report No. 1	2%
5. Monitoring Report No. 2	2%
6. Monitoring Report No. 3	2%
7. Monitoring Report No. 4	2%
8. Monitoring Report No. 5	20%
Total	100%

One controversial risk-sharing component is the warranty, or “clawback” provision, which kicks in after the final payment has been made. Under the clawback provision, CPRA can demand repairs or claw back a prorated portion of the payments if 20 percent of the restored marshland falls below agreed thresholds from years 6 through 20. The RFP provides the following example: *“If in Year 18 the percentage of the fill area meeting the required elevation falls below 80%, ten percent (2 years remaining of a total of 20-year Project life) of the Contract Price will be withheld.”*

Analysis by EPIC concluded that past CPRA projects had much higher failure rates and no enforced marsh retention goal in 20 years.

Selection and Rejection

Four developers submitted proposals, and, in keeping with the two-step selection process, both CPRA and the Louisiana TIG reviewed the technical merits of each without reviewing the price. They selected a 700-acre project designed by Restoration Systems on its technical merits, but then balked at the price: \$64.75M total, or \$92,500 per acre, including the 20-year warranty.

CPRA argued that it could deliver the same results, using the same subcontractors, for between \$44.7M and \$63.5M total, or \$61,956 to \$86,817 per acre. It also conducted a Value for Money (VFM) assessment to account for the risks that the winning proposal assumed, and it concluded that, even adjusting for risk, CPRA could deliver the project for roughly \$8 million less.

However, the EPIC analysis identified an error in the math that reduced the value-adjusted difference by \$5 million. EPIC’s evaluation also took issue with CPRA’s modeling of cost overruns, and its decision not to include the value of ecosystem services resulting from an accelerated delivery.

Questions Raised and Lessons Learned

Louisiana is an outlier in this report, in that CPRA is far from sold on the value of full-delivery over design-bid-build. (That may reflect an inherent selection bias on our part, since we explicitly reached out to administrators who were utilizing full-delivery contracting – and were thus already on board. Indeed, when we interviewed administrators in jurisdictions that had not embraced full-delivery, we encountered widespread skepticism.)

Key reasons that a P4P model was ultimately unsuccessful in the Louisiana case include the following:

Institutional Culture, Strategic Priorities, and Control

Most administrators interviewed for this report described an evolutionary process towards full-delivery contracting marked by hesitation about giving up control over processes for which they will ultimately be held responsible. The EPIC Analysis concluded that “CPRA staff, with years of experience in other forms of contracting, simply have a cultural bias against this new form of contracting which is perceived to give government employees less control over projects.”

CPRA staff dispute that there is a “bias,” but they do see project management as a core competency, whereas managers of other programs tend to describe themselves as “managers of managers,” focused on strategic objectives, and open to farming out the work of managing a fluctuating pipeline of projects. CPRA staff also said they had experienced none of the finger-pointing or disputes that other agencies reported when dealing with multiple contractors.

Full-delivery proponents counter that CPRA is overburdened and point out that it had yet to break ground on projects financed through the DWH NRD Fund, although several projects had been contracted at the time of writing. The rejected proposal, for example, involved several subcontractors, and proponents argue that CPRA could increase the number of projects by farming out that administration.

Improved Access to Out-year Finance

When the P4P project was initiated, the state had no access to out-year funds due to restrictions on bonding and borrowing. The legislature has since passed laws changing this, and CPRA says they are currently investigating borrowing funds from multiple sources to move projects up in the queue. They believe this will make it possible to access capital at rates not presently available to them.

Marsh Restoration Doesn’t Have a Market-Tested Reference Price

At the core of the dispute is the lack of a market-tested price for the finished product, which in this case is an acre of restored marshland that is still viable in 20 years. CPRA has always contracted for dredging and filling on a cubic meter of fill rather than an acre of restored marshland. As a result, it was comparing a binding bid to a modeled price. Furthermore, the cost of restoring marshland as required under the RFP is highly variable by location, making direct cost comparisons difficult. The Louisiana TIG, for example, recently approved the solicitation of bids on a 1,207-acre design-bid-build project at the cost of \$176M, including design work completed to-date. This comes to \$145,000 per acre,³⁴ which is substantially higher than the \$92,500 acre full-delivery bid that CPRA rejected, even without the 20-year warranty factored in. It is also further away from the dredging site, making direct cost comparisons difficult.

Table 9. Wide Price Variance in Coastal Marsh Creation Projects in Louisiana

CPRA PROJECT	COST	CONSTRUCTION ACREAGE	COST PER CONST. ACRE	NET ACREAGE	COST PER NET ACRE
Little Lake Shoreline Project	\$29,500,000	1,373	\$21,486	713	\$41,374
Lake Hermitage Marsh Creation	\$34,800,000	1,600	\$21,750	447	\$77,852
RES	\$65,000,000	722	\$90,028	578	\$112,535
Barataria Bay Rim MC	\$23,838,905	444	\$53,691	251	\$94,976
East Leeville MC	\$35,066,972	484	\$72,452	322	\$108,904
ESP	\$65,000,000	722	\$90,028	578	\$112,535
Restoration Systems	\$64,750,000	700	\$92,500	560	\$115,625
NE Turtle Bay MC	\$44,109,317	687	\$64,206	372	\$118,573
Grand Bayou Ridge and Marsh	\$41,795,419	719	\$58,130	336	\$124,391
Bayou Dupont	\$38,200,000	309	\$123,620	283	\$135,000
Ecosystem Investment Partners	\$65,000,000	537.3	\$120,975	430	\$151,219
Bayou Dupont Sediment Delivery #3	\$18,119,679	323	\$56,098	118	\$153,557

Notes: Using CPRA data, the EPIC analysis found wide price variance for acres delivered, even allowing for a worst-case scenario of a 20 percent failure rate in the full-delivery projects submitted. In the above table, Cost/Const Acre is the price per acre contracted, while Cost/Net Acre is the price per acre delivered. The four shaded projects are the proposed full-delivery projects, assuming a 20 percent failure rate, compared to a 48 percent failure rate for other projects listed.

Source: Environmental Policy Innovation Center, "An Analysis of Outcome-Based Performance Contract Bids and the Coastal Protection and Restoration Authority's Response."

Large Marsh Restoration is Different from Small Stream and Wetland Restoration

The winning marsh restoration project would have utilized several subcontractors, all of whom are known to CPRA. Managing multiple contractors increases administrative complexity, but for comparison, Corvias is working with 2,000 subcontractors in Prince George's County (see Part II of this report) while the winning marshland proposal dealt with less than 20. CPRA argues that administering large projects is less burdensome than administering a large number of smaller projects, so that the argument of reduced administrative burden is less persuasive than in other case studies included in this report.

Third-Party Land Acquisition is Seen as Disruptive to CPRA's Larger Strategy

With the exception of the North Texas Municipal Water District, every other contracting agency interviewed for this report identified "getting out of the land business" as a key reason for utilizing full-delivery contracting. CPRA, however, fears that prices will become artificially inflated if developers begin competing for rights to degraded marshland.

The Royal Engineers Summary echoes this, when it says that "allowing proposers to select project areas across a wide geographical area (e.g., a basin) complicates and delays implementation relative to the Louisiana TIG, which must initiate and complete the lengthy restoration planning process from the beginning for each new project location." It says participants suggested precluding bidders from purchasing land rights, especially oyster rights, which are seen as critical to the local economy, and instead letting CPRA choose a site and let contractors bid for delivery on it. CPRA argues this would prevent bidders from only developing projects "where they are convenient or cheapest" and also avoid "bidding wars for land rights, difficulty in comparing project proposals, and increased cost to proposers having to identify project areas."

P4P contractors, however, argue that site selection has been key to their delivery of cost-effective mitigation and that, in the larger scheme of things, bidding wars are both necessary and beneficial. In North Carolina and Maryland, for example, market participants described aggressive searches for mitigation sites that delivered the most ecological potential, and a willingness on the part of developers to compete for access, coupled with an ability on the part of program administrators to select sites based on ecological impact.

The Royal Engineers Summary recommends that CPRA should acquire all necessary land rights and oyster leases for the projects using standard CPRA policies and procedures. "Doing this will ensure that the [full-delivery] Program does not negatively affect future CPRA land rights or oyster lease acquisition and will not add time or risk to the project as it should be completed prior to project solicitations."

CPRA Disputes Claims that Private Providers Deliver Higher Quality

Because they work on a performance basis, full-delivery providers are theoretically forced to deliver higher quality outcomes. CPRA argued, however, that the submitted proposals offered no qualitative advantage over their own developments, and that some of the proposed timeframes were unrealistic. The EPIC Analysis, drawing on CPRA data, however, said that the 20-year success rate for constructed marshland is 52 percent, while the full-delivery projects come with a 20-year warranty on 80 percent of the restored areas.

The Challenge of Valuing Time

CPRA has struggled to break ground on marsh restoration projects utilizing the DWH NRD Fund. We have seen from other projects in this report that full-delivery contracting offers a possibility of moving quickly for two primary reasons: first, because full-delivery contractors are

incentivized to finish their work quickly in order to get paid, and second because private-sector operators are unencumbered by government procurement restrictions. In interviews, CPRA officials concede that full-delivery providers can move more quickly, but argued that it was not fast enough to justify the perceived price difference.

The Challenge of Valuing Risk

Everyone agrees that the 20-year warranty added to the cost of the project, and the Royal Engineers Summary indicated this could have added as much as \$6,000 per acre to the project cost. They suggested limiting the amount of the clawback to 10 percent of total project cost.

Part II: Stormwater and Green Infrastructure in the Chesapeake Bay Watershed

Cities around the United States are faced with increased capital costs to reduce the amount of storm water flooding into waterways, bringing with it everything from antifreeze and oil to bacteria, nutrients, and pesticides. This is especially true in the Chesapeake Bay watershed, which funnels stormwater and agricultural runoff from 150 waterways spread across six states, plus Washington, DC, into the country's largest estuary.

Over the past several decades, the watershed has become subject to federal regulations for both point-source pollution – such as from factories and municipal wastewater systems – and non-point-sources of pollution – primarily stormwater runoff from urban areas. These regulations serve as drivers of P4P activities in several states, but none more than in Maryland.

Federal Regulatory Drivers: Stormwater

Under CWA, point sources are prohibited from discharging pollution into federally protected waters unless granted permits by the EPA through the National Pollutant Discharge Elimination System (NPDES). NPDES was subsequently amended in 2000 and 2009 to include Municipal Separate Storm Sewer Systems (MS4). MS4 permits land cover systems that funnel untreated stormwater into federally-protected waters – mostly through city-owned sewers and canals that empty into waterways without treatment, although some MS4 permits apply to public universities, departments of transportation, and other entities.

While NPDES MS4 permits are required in municipalities across the country, the Chesapeake Bay is covered by an additional limitation that includes unregulated agricultural runoff. In other words, states are on the hook to find a way to get farms to reduce runoff without forcing them to do so.

Federal Regulatory Driver: the Chesapeake TMDL

Prior to 2010, states were individually responsible for their non-point runoff into the Bay, and each jurisdiction responded by developing its own protection program based on its own priorities – which at the time ranged from the revitalization of oyster beds, to the restoration of specific riparian habitat, to no priorities at all.

As a result, the Bay continued to deteriorate, and in 2010 the federal government imposed a mandatory Chesapeake Bay Total Maximum Daily Load (TMDL), which sets limits on the total amounts of nitrogen (185.9 million pounds), phosphorous (12.5 million pounds), and sediment (6.45 billion pounds) that the Bay can handle per year, in total and by state. The critical regulatory driver is Executive Order 13508, which set the total and state TMDLs and mandated they be achieved by 2025, with progress being evaluated and adjusted every two years.

In addition to providing a regulatory driver, the TMDL provides a clear and standardized metric of success that didn't exist before. By mandating only the TMDL and timeline, however, it leaves room for innovation at the local level – provided the ultimate goal is being met. This was further formalized in the Chesapeake Bay Watershed Agreement, which established 10 goals and 31 outcomes, including specific localized TMDLs, and established a process through which the seven jurisdictions can work together to create individual Watershed Implementation Plans (WIPs).

Maryland's Stormwater Utility Fee

In Maryland, the federal EPA has delegated authority for implementing NPDES MS4 permits to the Maryland Department of the Environment (MDE), and in 2012, the state legislature passed the Watershed Protection and Restoration Program (HB 987) which mandated that nine heavily developed counties, plus the city of Baltimore – all MS4 permittees – impose a Watershed Protection and Restoration Fee (WPRF) on landowners based on the amount of “impervious surface” covering a property. The fee provides income for local jurisdictions to fund projects identified in the state's Best Management Practices manual.³⁵ These can range from outright conversions of impervious surfaces to stream restoration and stormwater pond retrofits to industrial treatment and increased street cleaning. At the same time, landowners who make improvements on their own land can get credit against their stormwater bill.

Under the State's permits, “impervious acres treated” provide a proxy for nutrient and sediment reductions that local regulators can use to estimate their impact on the TMDL. Specifically, impervious acres in the drainage area are considered treated 100% for water quality when the runoff from one inch of rainfall over the drainage area is captured and treated. This would serve as a basis for assessing taxes, modeling performance, and ultimately for contracting on a P4P basis.

In 2014, all of the regulated jurisdictions, plus the State Highway Administration, were issued a more stringent NPDES MS4 Permit, requiring upgrades equivalent to removing or restoring 20 percent of all existing impervious surface areas on a staggered basis from late 2018 through the middle of 2020.

Not coincidentally, Maryland appears to be a hotbed of full-delivery contracting, with programs underway in Howard, Anne Arundel, and Prince George's Counties, two of which are featured in these case studies.

Anne Arundel County and the Impervious Acre Currency

Anticipating the state of Maryland's new NPDES MS4, Anne Arundel County created the Watershed Protection and Restoration Program (WPRP) in June 2013. The program uses a stormwater utility fee, called the Watershed Protection and Restoration Fee, to finance the treatment of impermeable surfaces.

In 2016, the program began shifting from design-bid-build to full-delivery contracting, with payments based on impervious acres treated. Full-delivery now accounts for roughly 10 percent of the County's contracts, and administrators say the cost per acre could be 50-60 percent lower than conventional contracting mechanisms.

Highlights

- Anne Arundel county used funding from a stormwater fee to enter into full-delivery contracts using an impervious acre currency as a proxy for performance.

- In early contracting rounds, the full-delivery contracting structure as reduced costs as much as 60 percent per acre.

Overview

When MDE issued new NPDES MS4 permits across the state, the widespread demand for restoration and design work sent prices spiraling upwards – and left counties in a position where their income came from stormwater fees, their costs went to component activities through design-bid-build, and their accountability to the state was based on MDE’s impervious acre credit. As a result, income and liabilities were aligned, but costs were not, and many counties faced overruns.

In 2016, Anne Arundel’s Watershed Protection and Restoration Program, which has since become the Bureau of Watershed Protection and Restoration, decided to align its contracting with its income and obligations by developing a Full Delivery of Water Quality Improvements solicitation process that would make it possible to solicit bids on a standardized per-acre basis and encourage price competition.

In 2017, Resource Environmental Solutions (RES) was selected as part of the first Full Delivery solicitation to retrofit three stormwater ponds. Their selection was based on providing the lowest cost per impervious acre treated – 60 percent less than traditional County implementation costs – using a technically sound approach. RES would not be paid at all until the facility installations were completed and inspected by County staff. This approach shifted nearly all the County’s risk onto the implementing contractor.

RES won the contract and delivered the results by engaging the technology firm, OptiRTC, which developed a Continuous Monitoring and Adaptive Control (CMAC) system that allows water levels in the pond to rise safely during rain events to store, retain, and treat stormwater onsite. This CMAC management system proactively monitors weather forecasts and actuates drainage valves to minimize flooding and run-off. The full \$3.8M award was only paid upon completion of the project and verification of its benefits. Ultimately, the project provided the treatment of an additional 119 acres of impervious area.

WPRP awarded a second pay-for-performance contract, valued at \$1.7M, to I97 Sewer, LLC to provide the connection of four major commercial facilities on aging septic systems to the public sewer network. Once connected, wastewater loads will be treated to the highest limits of technology at the County’s wastewater plants equipped with enhanced nutrient removal (ENR) technology, resulting in significant water quality improvements. The combined effort will leverage in excess of \$4M in private funding to put the equivalent of over 290 homes onto public sewer. This project will result in the equivalent of 113.5 acres of treatment.

The 2019 solicitation resulted in the selection of three firms to construct four projects, consisting of three living shorelines and one stream restoration, anticipated to deliver 255 acres of equivalent impervious credit. This year, the County made its fourth award for two living shoreline projects.

Administrators estimate that the like-for-like costs are roughly 50 percent lower compared to design-bid-build, but further exploration is needed to pinpoint the exact cost savings.

Full-Delivery: A Growing Percent of the Total

The contracts awarded in fiscal 2019 represent 225 acres, which is 14 percent of the 1,579 acres completed that year. Although awards and completions are, obviously, different things,

program administrators estimate that full-delivery now accounts for 10-15 percent of all contracted work underway.

The percentage under full-delivery is increasing steadily as old contracts expire, and could reach as much as 25 percent of contracted business in the future.

Risk Sharing and Quality Control

As in all projects profiled, the program is constantly adjusting to balance the efficiencies gained by utilizing full-delivery with the need to maintain quality control. Full-delivery contractors receive no up-front payments, but instead receive a lump sum when the finished project passes inspection, followed by five annual maintenance payments spelled out in the contract. The County evaluates bids in a two-step process, beginning with a technical review conducted by a committee of internal experts - many of whom will also be managing and overseeing the projects once underway. Program administrators emphasize that this review, and the staff needed to carry it out, are critical to the success of the program.

How are Costs Improved?

Although it's tempting to attribute the reduced costs to a one-time savings associated with OptiRTC technology, the program administrator says the costs are also lower in projects that generate impervious acre credits without the technology, such as wetland restoration (see Table 10 for a list of activities). This is attributed to several factors.

- First, because government procurement requires review of each contract, it can take up to five years to complete a single project, increasing costs substantially. An individual company getting paid on delivery and without requiring approval for each step can complete the project more quickly and also has the leeway to select more expensive subcontractors whose work may save costs over time.
- Second, the bidding process creates a standardized outcome that forces competition among bidders, whose survival in turn depends on them accurately measuring costs.
- Third, the program's technical review process filters out projects that seek to generate credits by grabbing low-hanging fruit or conducting restoration where it's not necessary.

Changing Composition

Interestingly, although mitigation bankers dominated the first round of bidders and many larger government contractors have chosen not to join the bidding process, smaller local providers with no experience in mitigation banking have adjusted to full-delivery and are even thriving. Administrators singled out two local companies - Bay Land Consultants and Underwood and Associates - as local companies that have emerged as pay-for-performance developers, while larger engineering firms are more likely to become subcontractors.

Table 10. Total Acres of Green Infrastructure Installed as of 2019, by Project Type, Anne Arundel County

RESTORATION PROJECT	IMPERVIOUS ACRES CREDITED	
	COMPLETED IN FY2019	COMPLETED - CUMULATIVE AS OF FY2019
Restoration Best Management Practices		
ESD	1.4	18.1
Structural	203.6	773.7
Alternative Restoration Best Management Practices		
Street sweeping*	191.7	168.9
Impervious surface elimination	0	0.3
Reforestation	0.6	0.6
Catch basin and storm drain cleaning*	115.5	69.8
Stream restoration**	549.1	839.5
Outfall stabilization	14.8	31.3
Shoreline management	30.3	627.2
Septic pumping***	387.3	287.0
Septic denitrification****	76.4	298.7
Septic connections to wastewater treatment plant	8.6	54.6
	1,579.3	3,169.7

*For annual practices, cumulative progress values are based on the average equivalent impervious treatment achieved after full implementation of the programs. Averages for street sweeping and septic pumping are based on FY16-FY18, and catch basin cleaning is based on FY17-FY18. FY19 implementation of annual practices shows the County has maintained a level of programmatic effort beyond that required to continue claiming the average annual credit.

**Equivalent impervious credit for stream restoration projects is no longer capped based on the impervious area within the project drainage area, per the latest guidance provided by MDE (MS4 Phase I Large Tentative Determination Permit MACO Meeting, January 16, 2020).

***The County's cumulative average septic pumping credit was revised from that reported in FY18. Additional data was obtained from the County's water reclamation facilities and is detailed in an MS4 geodatabase available from the County.

****The FY19 credit total includes septic denitrification systems that were installed in previous reporting years, but were newly identified during a data cleanup effort by the County Department of Health. These "newly found" systems are identified in the MS4 geodatabase.

Source: Anne Arundel County.

Notes: The County has treated 3,170 acres of impermeable surface, and administrators estimate up to 25 percent of this work could, in the future, be undertaken through full-delivery contracting, reducing costs substantially.

Box 3. Principio Creek: Payments for Clean Water

While Anne Arundel County chose to use a universal metric for all mitigation strategies, the Principio Restoration Project, located on a dairy farm in a sub-watershed called Principio Creek, utilized a strict performance metric tied to water quality. Such strategies are rare at the project level, due to the number of variables beyond most developers' control.

The project is being spearheaded by the Cecil Land Trust, which negotiated a permanent easement with the Horst Brothers Dairy Farm.

All up-front capital comes from investors in the for-profit restoration group Ecosystem Investment Partners (EIP). The project is restoring 8,215 linear feet of streams and 24.8 acres of riparian buffers, with the aim of reducing discharge of nitrogen by 6,219 pounds per year, discharge of phosphorous by 1,850 pounds per year, and total suspended sediment by 1,344 tons. EIP hopes to turn a profit at the end of the project by selling discharge reduction units to the Fund at a price of \$800 per unit – or less than half the current average cost across the watershed.

Because the final payment is based purely on discharge-reductions verified in-stream, the state only pays for actual reductions achieved.

Clean Water Partnership: Partnering on Planning

Prince George's County, Maryland, recently spent \$100 million to install grassy surfaces, rain gardens, and other elements of green infrastructure on 2,000 acres of parking lots, pavement, and roofs. The project involved hiring and training hundreds of locals, many through minority-owned startups, to improve church grounds, schoolyards, and residential complexes.

The payment and the improvements came in the first phase of the Clean Water Partnership (CWP), which is a \$210-million community-based public-private partnership (CBP3)³⁶ between the County and Corvias LLC. Under the agreement, Corvias is managing the installation of green infrastructure on 4,000 acres of impermeable surface, with payments based on a blend of costs and performance. The performance payments are based on five criteria, three of which are contingent on social impacts.

Highlights

- Prince George's County, the contracting agency, outsourced management of a very large and complex green infrastructure expansion to the private sector.
- "Performance" is defined in terms of both ecological and socio-economic outcomes: Payments are contingent on speed of implementation and utilization of local workforce.
- The full-delivery contract includes both installation and long-term maintenance components.

Overview

Prince George's County began experimenting with green infrastructure in the 1980s, and started retrofitting its 30,000 impervious urban acres in the 1990s – 50 acres at a time. With the advent of the Chesapeake TMDL in 2010 and the state's preparation for a new NPDES MS4

permit to become effective in 2014, the County saw an opportunity to accelerate its green infrastructure program.

In 2012, it developed a new WIP that required upgrading roughly 15,000 impervious acres by 2025, with 6,105 acres to be finished by 2019 and much of that in the form of green infrastructure. It was a massive task that would require the coordination of more than 1000 complex projects conducted by private contractors, community groups, homeowners' associations, and school districts. Its estimated price was \$1.2B. The County decided to manage 11,000 acres of both gray and green infrastructure upgrades itself while contracting out the expansion of green infrastructure on the remaining 4,000 acres through a new initiative, the CWP.

The County designed the incentive structure after reviewing previous partnerships in both the ecological restoration and military housing sectors, and it explicitly encouraged responses from companies with extensive experience in public-private partnerships.

The program is well-documented in a publication called "Prince George's County's Approach to Meeting Regulatory Stormwater Management Requirements," which is readily available online.³⁷

Selection and Negotiation

The County worked with outside advisors to formulate a Request for Qualifications (RFQ) that was put out for bid in 2013 seeking private-sector entities with experience in public-private partnerships.³⁸ The evaluation criteria were broken down as follows, but with an opportunity for responders to earn 15 additional points by including strategies that supported Minority Business Enterprises (MBEs).

Table 11. Selection Criteria Used by Prince George's County to Evaluate Private Sector Green Infrastructure Bids

CRITERIA	WEIGHTING
Factor 1: Public/Private Partnership Experience	0-35
Factor 2: Strategy/Approach	0-35
Factor 3: Financial Capability	0-20
Factor 4: Socio-economic plan	0-10
Total	0-100

The County selected Corvias in September, 2013 and negotiated two contracts that were finalized in 2015: a Master Program Agreement (MPA), which covers two three-year building phases - one from 2015 to 2018 and from 2018 to 2021 - and a Master Maintenance Agreement (MMA), which is a 30-year operations and maintenance agreement that includes upkeep, inspection, repair, and replacement of the best management practices (BMPs) installed under the MPA.

In contrast to the County's traditional contracting program, hundreds of BMPs will be implemented with a schedule lasting at least three years, which means Corvias has more

flexibility to negotiate contracts with subcontractors and material suppliers to achieve lower costs with an optimized implementation schedule. The CWP is set up such that the County and Corvias can modify the requirements of the CWP without renegotiating the fee or services, as long as it does not disrupt the predefined CWP performance goals and is approved by the County's oversight committee consisting of representatives from various departments in the County.

First Phase Outcomes

The two phases identified within the MPA include an initial three-year phase, during which \$100 million was allotted for retrofitting 2,000 acres of impermeable surface, and a second three-year phase that was contingent on the successful completion of the first and allotted \$110 million for retrofitting another 2,000 acres. The County renewed the MPA for its second phase after Corvias achieved all performance milestones and came in 40 percent cheaper than the County's own efforts of similar size and scope.

According to its three-year report,³⁹ the CWP completed 94 projects at \$8 million under budget and generated 2,129 acres of certified impervious acres. It also exceeded socioeconomic targets for inclusion of local, small, and minority-owned business, with an estimated \$183 million economic impact. From a runoff perspective, the improvements catch and filter more than 1.6 billion gallons of runoff per year.

The Partnership that Pays for Progress

The County said from the beginning that it wanted to create a partnership that generated both green infrastructure and green jobs that benefitted the community, and the MPA clearly describes a partnership rather than a classic client/vendor relationship. "The Parties shall cooperate with one another and exercise all reasonable efforts in performing their obligations under this Agreement to facilitate the development and timely implementation of the Annual Plans during the Term," it says. Still, there are clearly defined roles. Corvias acts as the CWP's program manager while the County's Department of the Environment provides oversight, with support from the Department of Public Works and Transportation as well as the Department of Permitting, Inspection and Enforcement.

The three agencies cooperate on an oversight committee that meets regularly, and they work with Corvias to develop annual plans that include projects that all parties agree on developing. Once projects are agreed on, Corvias is given broad leeway for designing, building, and maintaining them.

The contract also describes two sets of payments: base fees that are based on incurred costs and incentive fees based on five variables, two of which are related to achieving cost and time objectives and three of which are related to socioeconomic benefits.

Risk Sharing and Incentive Fees

Corvias is not required to acquire land, but it does take on substantial risk. It finances up to 40 percent of the construction itself and handles all of the subcontracting, which enables it to move quickly while reducing the administrative burden on the County. The company has the ability to finance up to 40 percent of the program's costs up-front and is paid over the life of the agreement through stormwater fees on local residents and businesses.

Roughly half of its compensation is based on incentive fees that are based on verifiable outcomes. Two are contingent on the company hitting its budget and delivering projects that pass inspection on schedule, while the other three are based on socioeconomic impacts. These

are the “Local-Based Small Business Incentive,” the “Target Class Incentive,” and the “County Resident Participation Incentive.”

As a part of CWP requirements, Corvias developed a Community Outreach Program that includes a public dashboard so that stormwater utility fee payers can follow progress over time. Figure 3 provides a snapshot from the dashboard, showing construction progress to date.

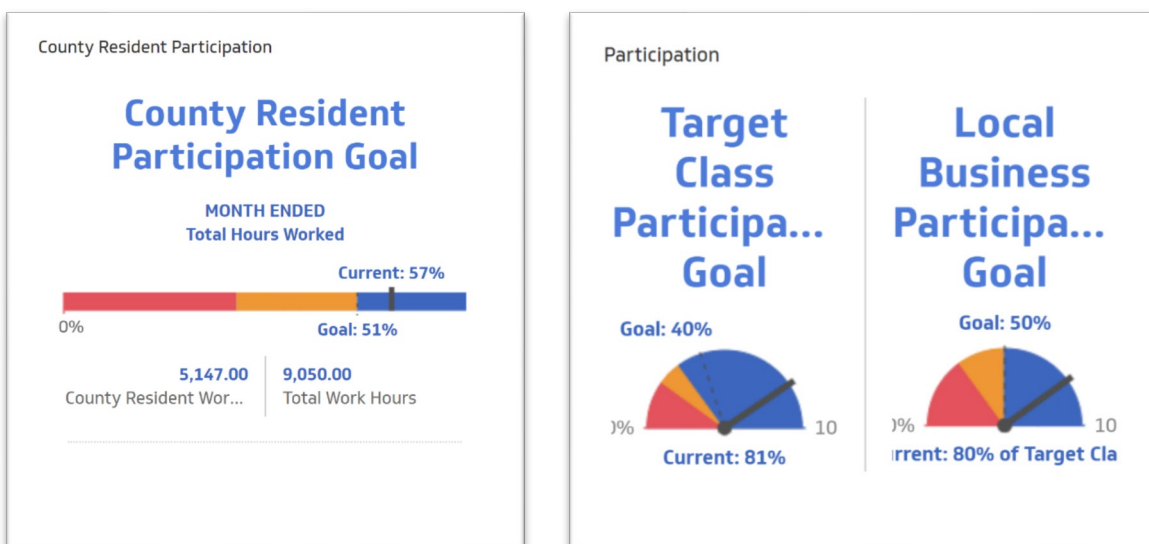
The dashboard also shows progress on the three socioeconomic benchmarks (Figure 4).

Figure 3. Corvias Construction Progress Dashboard for the Clean Water Partnership, Prince George’s County

Acre Status		
Phase	Project Count	Total Impervious Acres
DESIGN	33	2,122.02
CONSTRUCTION	7	570.09
COMPLETED	155	2,691.31
	195	5,383.42

Notes: This publicly available dashboard shows the number of acres restored and those in the pipeline. The pipeline includes a buffer of projects in the design phase that may not be completed. Accessed August 21, 2020.

Figure 4. Corvias Socioeconomic Progress Dashboard for the Clean Water Partnership, Prince George’s County



Notes: Corvias’s performance fee is also based on achieving three quantifiable participation requirements. Accessed August 21, 2020.

Benefits of Community-Based Public-Private Partnerships

Community-based public-private partnerships like the CWP are specially adapted to deliver green infrastructure with performance metrics aimed at providing environmental, economic and social benefits in underserved, urban communities.

The overall scale of the program and a continuous pipeline of projects create certainty for contractors that enables them to bid more competitively. The partnership has won high marks from small contractors for its quick pay program. The CWP provides an opportunity for local small business growth and expansion. Once a contractor is a part of the CWP and performs well, it is likely that the contractor would be retained by the private partner for the long term. This will allow the contractor to hire staff, because there will be more certainty about future work and a more continuous cash flow. This was not achieved through the County's traditional approach for bidding separate contracts for each BMP.

The County singles out the Mentor-Protégé Program through which Corvias will train and guide the County workforce on business planning, staffing, purchasing, and marketing. Indeed, the CWP has developed a wide range of education and outreach efforts to inform and engage schools, universities, County residents, community leaders, and other interested parties about different aspects of stormwater management and green infrastructure.

The program also has had positive impacts in terms of environmental literacy and education among the County's youth. Leveraging the delivery of low impact development and GI on projects on Prince George's County Public Schools sites, the program works with Green Ambassadors and stewards to support stormwater management education and careers in the environmental field by adding outdoor classrooms in alignment with local NGO Anacostia Watershed Society. The CWP also collaborates efforts with a summer youth employment program, led by End Time Harvest Ministries, to offer six-week environmental health summer internships. Youth participants receive stormwater management work experience and learn how stormwater directly impacts the health of their communities.

Box 4. BARC and the Art of Creative Land Acquisition

Getting land set aside for ecological restoration isn't always a matter of friends and farmers. Sometimes, it's more like piecing together a jigsaw puzzle. That's how ecological restoration group GreenVest approached a full-delivery project on 25 acres of badly degraded acres of the Henry A. Wallace Beltsville Agricultural Research Center (BARC).

BARC is a research facility spread over 6,600 acres in Prince George's County. The 25 degraded acres drain into the headwaters of the Anacostia River, which feeds into the Potomac River and eventually into the Chesapeake Bay. For over a century, the USDA has been using BARC to test everything from new methods for increasing crop production to better practices for improving water quality. The site remains a hotbed for research, but USDA had become increasingly concerned about its impact on the Anacostia watershed, which is one of the most degraded in the area surrounding Washington, DC.

Hearing of USDA's concerns, GreenVest approached USDA with an offer to restore the property for free if USDA could secure federal approval to encumber the land with a covenant that would serve the purpose of an easement, which is not permitted on government land. This required amending the agency's master plan for the center, which in turn required Congressional approval.

GreenVest began restoration as the approval process moved forward, under a single contract with USDA and three separate full-delivery contracts with different buyers. The result is a P4P on federal land that is financed through full-delivery contracts with three local agencies - two from Maryland's state government, and the third from the government of Prince George's County.

The biggest contract came from the Maryland Department of Environment, which had recently issued an RFP for roughly 13 acres of wetland mitigation through the Nontidal Wetland Grant Program of its Chesapeake Bay Trust, which administers in-lieu fees in the watershed. With that in mind, GreenVest began approaching other agencies that it suspected of needing stream and wetland mitigation - specifically the Maryland State Highway Administration and the government of Prince George's County, both of which were known to be seeking mitigation for infrastructure projects in the watershed.

Through several site visits, the company was able to identify 6,600 linear feet of degraded headwater stream and 22 acres of degraded wetland, all of which negatively impacted the Chesapeake Bay. By securing the right to restore the land at no cost, GreenVest was able to offer low-cost mitigation to all three government agencies, while USDA was able to bring a valuable portion of the land back to life.

GreenVest wrote detailed proposals outlining the ecological benefits each agency wanted, and describing which parcels would deliver which benefits - from reduced flows of sediments and nutrients amounting to 36,000 pounds over the next 30 years to floodplain reconnection and restoration, groundwater discharge and recharge, stormwater management, and the revival of wildlife habitat.

Part III: Environmental Impact Bonds: Hedging Your (Green) Bets

Environmental Impact Bonds (EIBs) are the yin to full-delivery contracting's yang: instead of paying contractors for delivering results, EIBs pay investors for their willingness to take a risk on innovative environmental solutions, and the impacts they generate.

The cities of Atlanta, GA, and Washington, DC, for example, turned to EIBs when they wanted to test new ways of deploying green infrastructure measures – DC to reduce “combined sewer overflows” (CSOs) and Atlanta to reduce flooding. Both cities were also interested in improving water quality.

The DC EIB works by paying investors a bonus if the green infrastructure it finances beats performance expectations, but it “claws back” the first five years’ interest from investors if green infrastructure performs below a certain threshold. The Atlanta EIB pays a similar bonus, but rather than clawing back interest if the green infrastructure underperforms, it features a lower base rate.

We should note that EIBs are usually used to finance new and untested concepts, or tested concepts that have trouble scaling. Once a concept is proven, the cities can float a regular municipal bond. Indeed, Atlanta’s Department of Watershed Management (DWM) issues several large municipal bonds each year to finance its large-cap improvement program, and only a small portion is allocated to green infrastructure.

Washington, DC Develops the First EIB for Stormwater

Created jointly by the DC Water and Sewer Authority (DC Water) and Quantified Ventures, the Washington, DC EIB is a \$25 million, tax-exempt, 30-year municipal bond with a pay-for-performance component that a former DC Water executive describes as “an insurance policy that only charges a premium if you file a claim.”

It was sold in a private placement to the Goldman Sachs Urban Investment Group and Calvert Foundation to finance a new green infrastructure component in DC Water’s \$2.6B Clean Rivers Project. It pays investors a one-time dividend after five years if the green infrastructure projects it finances reduce runoff by more than 41.3 percent, but claws back the first five years’ interest from investors if the runoff is reduced by less than 18.6 percent.

The green infrastructure components have been well-documented through case studies published by Quantified Ventures and The Resilience Shift.⁴⁰ This study complements those by focusing on the financing mechanisms and comparing the DC EIB to the Atlanta EIB.

Highlights

- Washington DC deployed the first EIB for to expand urban green infrastructure.
- The DC EIC includes both a bonus payment to investors and a clawback provision for underperformance.
- If the EIB “proves out” the efficacy of green infrastructure, DC Water plans to follow up with a \$100 million conventional municipal bond to finance the remainder of its green infrastructure needs.

Overview

Until the late 1900s, Washington, DC had two sewer systems: one for sanitary waste that emptied into treatment plants and one for stormwater that drained into tributaries of the

Chesapeake Bay. Over time, the City combined the two systems so that stormwater could be treated before being released.

The combined system still overflows in periods of heavy rain. As of 2005 that CSO amounted to 2.5 billion gallons per year. The EPA responded with a consent decree⁴¹ that required DC Water to reduce CSO discharges 96 percent, and to do so by building massive tunnels that could store 187 million gallons of stormwater. Six years later, in 2011, DC Water petitioned the EPA for permission to incorporate green infrastructure into its runoff reduction plan. DC Water also began developing green infrastructure demonstration projects. Over time, it identified several hundred acres of impermeable surface area in the Piney Branch drainage area that it calculated could reduce runoff 30 percent if converted to green infrastructure – an amount that would have the same impact on CSO as adding 9.5 million gallons of tunnel storage capacity.

In 2015, the EPA agreed to amend the decree so that DC Water could swap some portions of the tunnel for specific green infrastructure improvements, but only if DC Water agreed it would still build the original grey infrastructure plan if the green experiment failed.⁴² The DC EIB was developed to finance these new green infrastructure installations for stormwater management.

The Metric: Reduced Runoff

Any performance-based mechanism needs an indicator that accurately reflects the performance of the improvements being made – preferably one that’s easy to generate and verify. DC Water used its 30 percent runoff reduction calculation as a benchmark, but ran a Monte Carlo simulation to identify possible outcomes over time.

Based on these simulations, DC Water and Quantified Ventures concluded there was a 95 percent probability of the green infrastructure improvements delivering results in a range that roughly met the requirements of the new consent decree, and a 2.5-percent likelihood of failing to meet it. They created a three-tiered bond based on the following:

1. **A 95 percent probability that the green infrastructure programs will reduce runoff between 18.6 percent and 41.3 percent**, which is in the “sweet spot” that will deliver the results needed to meet the requirements of the consent decree. If the results fall in this range, bondholders receive 3.43 percent interest payments and DC Water deploys the rest of its green infrastructure strategy using standard municipal bonds.
2. **A 2.5-percent probability that the green infrastructure will reduce runoff by less than 18.6 percent**, in which case DC Water will have to adjust its approach, incurring more costs in the process. If that happens, the bondholders remit \$3.3 million back to DC Water, effectively leaving them with zero interest.
3. **A 2.5-percent probability that the green infrastructure program will reduce runoff by more than 41.3 percent**, in which case the City is able to scale back the number of acres needed to meet the consent decree, thus saving money, which it remits to bondholders in the form of a \$3.3 million bonus.

Figure 5. Washington, DC’s Environmental Impact Bond Performance Structure

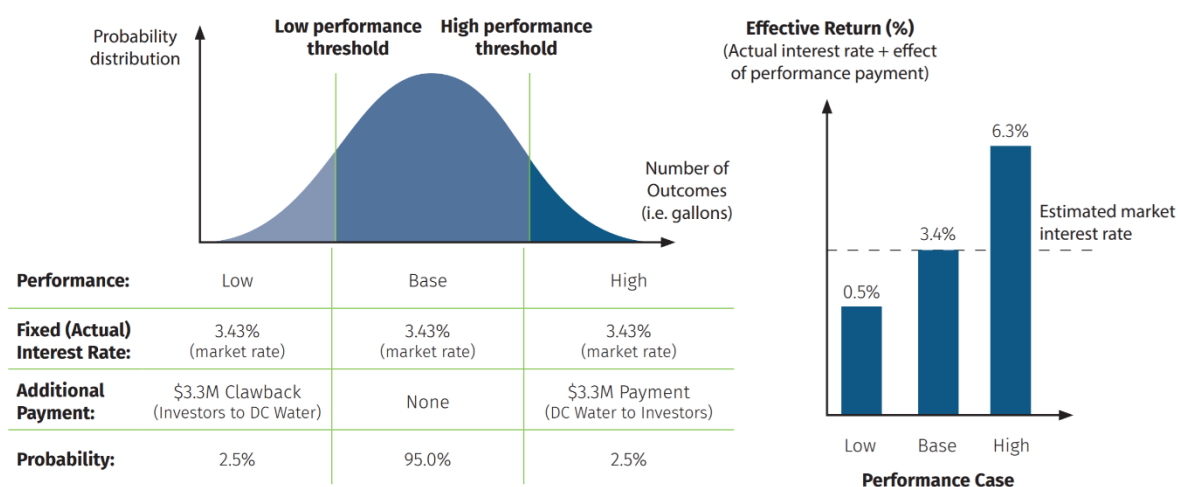


Figure Credit: Quantified Ventures.

Runoff from DC Water’s pilot property was measured using sensors embedded in storm sewers and verified by a third-party auditor before the bond was sold in 2016. Post-construction runoff is now being measured by the same sensors and evaluated regularly. DC Water plans to follow up with a \$100 million conventional municipal bond to finance the remainder of its green infrastructure needs.

Atlanta Takes it Public

Created jointly by the City of Atlanta’s DWM and Quantified Ventures, the Atlanta EIB is a \$14 million municipal bond that was issued at the beginning of 2019 to finance six green infrastructure projects. The projects are expected to generate \$18.2 million in economic value to the City over ten (years, primarily through flood risk reduction and water quality improvements. The performance payment is based on greater-than-expected storage capacity that correlates with an increase in economic value.

Unlike the privately offered DC bond, the Atlanta bond was publicly offered to test the municipal bond market’s appetite for EIBs. A public offering was also intended to set a precedent for the City of Atlanta to issue EIBs through more traditional municipal bonding offerings. As a result, Atlanta’s EIB has no provision for clawing back interest if the infrastructure improvements underperform, but went to market with a structure that would enable a lower base rate.

Highlights

- The City of Atlanta issued the world’s second EIB for expansion of green infrastructure, designed to increase stormwater storage capacity in the City through nature-based interventions.
- Atlanta’s EIB includes a bonus payment but no clawback.
- The city abandoned the clawback in an effort to “socialize” the process by attracting a broad range of investors.

Overview

As DC Water's privately-placed EIB was taking shape, Atlanta officials were engaging in peer exchanges with cities like Philadelphia, which had pioneered the use of stormwater fees to finance green infrastructure.⁴³ In 2017, the Atlanta City Council officially adopted a green infrastructure Strategic Action Plan, which prioritizes the use of green infrastructure through interdepartmental cooperation and external partnerships. Around the same time, the Rockefeller Foundation and Quantified Ventures were staging a nationwide competition to identify EIB proposals that might work as public offerings, which would give them access to the \$4 trillion municipal bond market.

DWM entered and won the competition, and the result is an EIB with a performance component based not on runoff captured, but on an increased storage capacity in the system.

The Metric: Stormwater Capacity

Hydrologic modeling identified a range of possible outcomes, but DWM needed a simple performance metric that met the following criteria:

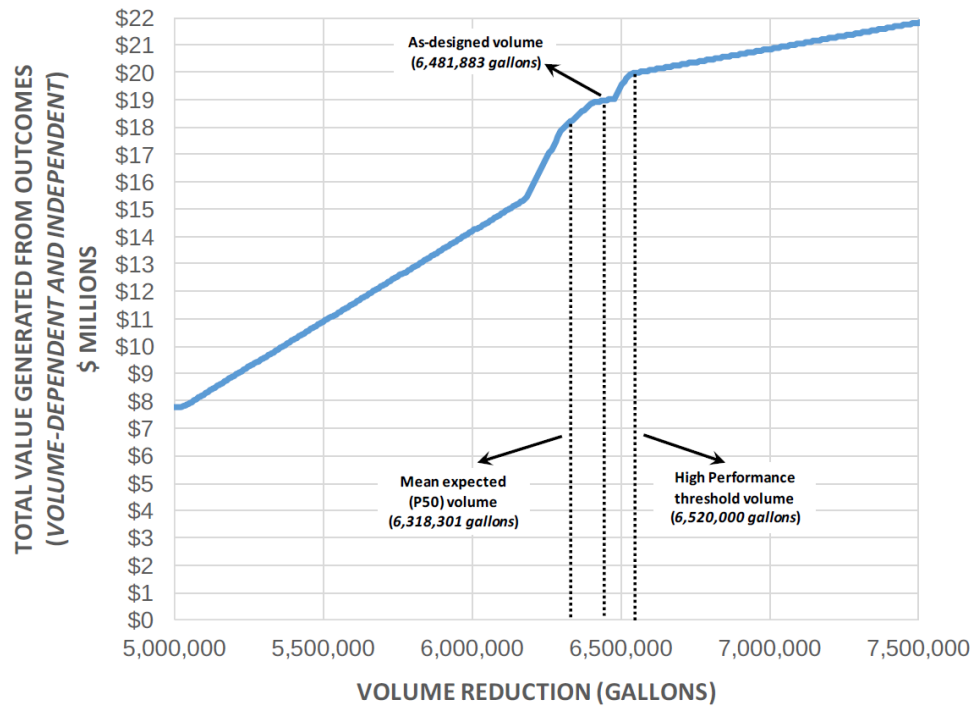
- It could encompass all six (6) projects,
- It correlated to improved ecological, financial, and social outcomes,
- It paid for itself, and
- It had a reasonable expectation of being achieved.

The Department contemplated several options that had been applied elsewhere, including a reduction in stormwater runoff, which DC Water had employed; social metrics such as workforce development, which Prince George's County had employed; and increases in treated retrofitted impermeable surfaces, which Anne Arundel County had employed. They concluded that the simplest solution was best: namely an increase in the system's capacity to handle stormwater runoff.

Modeling showed a steady increase in value to DWM as storage capacity increases, with that value leveling off after an increase of 6.52 million gallons (Figure 6). At that point, the value to DWM is \$19.9 million, and the probability of hitting this level 27.74 percent. Value to DWM maxes out at \$21.7 million, representing a potential for \$2.67 million above the \$18.2 million expected at a mean expected increase in volume of 6.3 million gallons.

To keep things simple, DWM set the payment threshold at 6.52 million gallons and the performance payment at \$1 million. This is the additional amount that will be paid to investors if the city exceeds the high-performance threshold in year six. The EIB will re-pay investors \$14 million at a slightly below-market interest rate over a 10-year bond repayment (Figure 7).

Figure 6. Economic Valuation Output Curve for the City of Atlanta’s Environmental Impact Bond



Notes: Modeling showed that the economic benefits of all EIB-funded projects increased dramatically until storage reached roughly 6.5 million gallons.

Figure Credit: Quantified Ventures.

Figure 7. City of Atlanta’s Environmental Impact Bond Performance Structure

Atlanta EIB Performance Structure

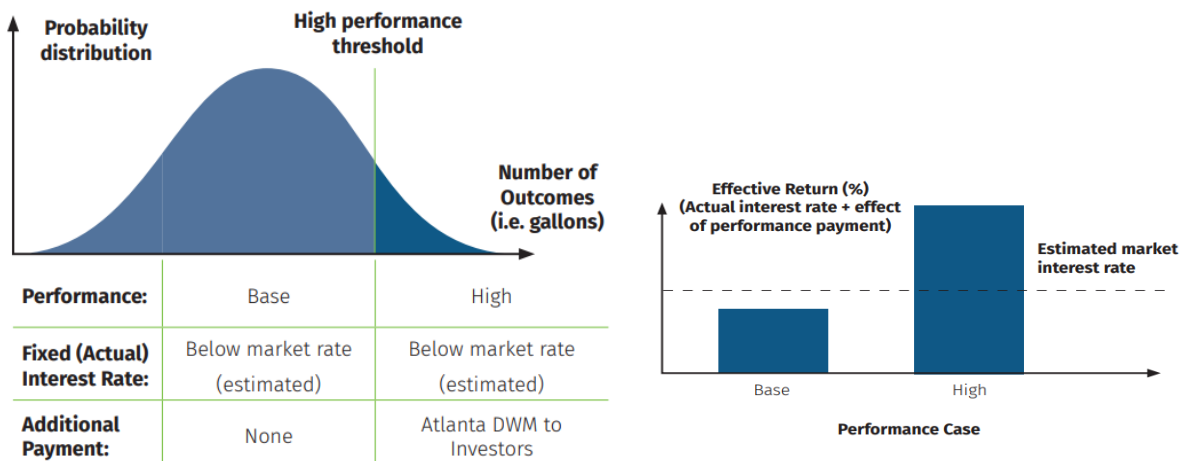


Figure Credit: Quantified Ventures

Endnotes

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- ¹ Results for America. (2015, November 11). Invest in What Works Fact Sheet: Pay for Success. Results for America. Retrieved from <http://results4america.org/wp-content/uploads/2015/08/PFS-fact-sheet-11-11-15.pdf>
- ² Hamrick, K. (2014, August 4), "Results-Based Finance: Breakthrough or Backslide?" Ecosystem Marketplace. Retrieved from <https://www.ecosystemmarketplace.com/articles/results-based-finance-breakthrough-or-backslide/>.
- ³ Caggiano, T. and Male, T. (2017), *Nature: Paid on Delivery*. Environmental Policy Innovation Center. Accessed at https://sandcountyfoundation.org/uploads/SCF_2017_EPIC_DOC_SMFL-NEW-TITLE2.pdf
- ⁴ The Environmental Policy Innovation Center is a nonprofit think tank that receives fiscal sponsorship through the Sand County Foundation, which is a 501(c)(3) tax-exempt public charity.
- ⁵ Paul, C., (2019), "Pay for Performance Contract Mechanisms for Stormwater Management," *Environmental Incentives*. Retrieved from <https://www.enviroaccounting.com/payforperformance/FileResource/GetFileResourceForProgram/6aa9d874-5c90-4723-a4dc-ce476ddd8c58>
- ⁶ Environmental Incentives is a for-profit environmental consultancy and Certified B Corporation focused on incentives-based environmental management.
- ⁷ Ecosystem Marketplace is a news and research group launched in 2005 by the environmental NGO Forest Trends.
- ⁸ Corporation for National & Community Service, Office of Research and Evaluation. (2015). *State of the Pay for Success Field: Opportunities, Trends, and Recommendations*. Washington, DC: Abt Associates.
- ⁹ United States Environmental Protection Agency, (2020). "Health and Environmental Agencies of U.S. States and Territories," USEPA. Accessed at <https://www.epa.gov/home/health-and-environmental-agencies-us-states-and-territories>.
- ¹⁰ We conducted full interviews with the following participants:
- Tim Baumgartner, North Carolina DENR
 - Glen Behrend, Atlanta DWM
 - Mike Brickman, North Texas MWD
 - Maury Chatellier, Coastal Protection and Restoration Authority
 - Benjamin Cohen, Quantified Ventures
 - Stephen Colomb, Resource Environmental Solutions
 - Michael Ellison, Arrowhead Research
 - Bren Haase, Coastal Protection and Restoration Authority
 - Amanda Hallauer, Atlanta DWM
 - Michael Hare, Resource Environmental Solutions
 - George Hawkins, Moonshot Missions
 - William Horton, Atlanta DWM
 - George Howard, Restoration Systems
 - Jeffrey Jurek, North Carolina DENR
 - George Kelly, Resource Environmental Solutions
 - Josanne Kennedy, Atlanta DWM
 - Zach Knight, Blue Forest Carbon
 - Doug Lashley, GreenVest
 - Pete Littleton, Corvias
 - Steve Long, North Texas MWD
 - James Lyons, Clean Water Partnership
 - Tim Male, Environmental Policy Innovation Center
 - Adam McIntyre, Waterland Solutions
 - Jeff McKito North Texas MWD
 - Erik Michelsen, Anne Arundel County Bureau of Watershed Protection and Restoration
 - Katie Riley, Environmental Incentives
 - Jeremy Sokulsky, Environmental Incentives
 - Matthew Stahman, Resource Environmental Solutions
 - Murray Starkel, Ecological Service Partners

- ¹¹ Forest Trends' Business and Biodiversity Offsets Program. (2018). "The Mitigation Hierarchy." Forest Trends. Retrieved from <https://www.forest-trends.org/bbop/bbop-key-concepts/mitigation-hierarchy/>

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- ¹² United States Environmental Protection Agency, "Federal Guidance for the Establishment, Use and Operation of Mitigation Banks," Federal Register: November 28, 1995 (Volume 60, Number 228), Page 58605-58614.
- ¹³ Corps of Engineers, Department of the Army, DOD; Environmental Protection Agency; Fish and Wildlife Service, Interior; and National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Commerce, Notice. "Federal Guidance on the Use of In-Lieu-Fee Arrangements for Compensatory Mitigation Under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act," Federal Register: November 7, 2000 (65 FR 66913), Pages 66913-66917.
- ¹⁴ Wayne White, "The Advantages and Opportunities," in *Conservation and Biodiversity Banking*, ed. Ricardo Bayon, Nathaniel Carroll, and Jessica Fox. Earthscan, 2012, pp34-35.
- ¹⁵ Hough, P and Harrington, R. (2019). *Ten Years of the Compensatory Mitigation Rule: Reflections on Progress and Opportunities*. Environmental Law Institute. Retrieved from <https://www.eli.org/sites/default/files/elr/featuredarticles/Jan19FA.pdf>
- ¹⁶ Praul, C., (2019). *Pay for Performance Contract Mechanisms for Stormwater Management*. Environmental Incentives. Retrieved from <https://www.enviroaccounting.com/payforperformance/FileResource/GetFileResourceForProgram/6aa9d874-5c90-4723-a4dc-ce476ddd8c58>
- ¹⁷ North Carolina Department of Environmental Quality, (2019). "A-2 Full Inventory of Properties Cumulative Properties through Fiscal Year 2018-2019." North Carolina Division of Mitigation Services. Retrieved from <https://files.nc.gov/ncdeq/Mitigation%20Services/Administration/Reports/2018-2019ar/A-2-Full-Inventory-Properties---2019-Completed.pdf>
- ¹⁸ North Carolina Department of Environmental Quality, (2019). "A-1. Property Information All Properties Closed During Fiscal Year 2018-19." North Carolina Division of Mitigation Services. Retrieved from <https://files.nc.gov/ncdeq/Mitigation%20Services/Administration/Reports/2018-2019ar/A-1-FY-Property---2019-Complete.pdf>
- ¹⁹ North Carolina Department of Environmental Quality, (2020). "Current Rate Schedules." Division of Mitigation Services. Retrieved from <https://deq.nc.gov/about/divisions/mitigation-services/dms-customers/fee-schedules>.
- ²⁰ Streamlines Newsletter, "The North Carolina Wetlands Restoration Program: Watershed Planning and Restoration" (Fall, 2001). Retrieved from https://files.nc.gov/ncdeq/Energy%20Mineral%20and%20Land%20Resources/Stormwater/Water%20Supply%20Watershed/Streamlines_WetlandsRestoration.pdf
- ²¹ North Carolina Department of Environment and Natural Resources, (2003, July 22). "STATE, FEDERAL PARTNERS SIGN STREAM AND WETLANDS AGREEMENT" [Press release]. NCDENR. Retrieved from <https://files.nc.gov/ncdeq/Mitigation%20Services/Administration/Agreements/EEP-MOA.pdf>.
- ²² North Carolina Department of Environmental Quality's Division of Mitigation Services In-Lieu Fee Instrument. (2010, July 28). "Agreement to continue the operation of North Carolina's In-Lieu Fee Programs operated by the North Carolina Department of Environment and Natural Resources' Ecosystem Enhancement Program pursuant to 33 CFR Parts 325 and 332 as revised effective June 9, 2008 (Federal Mitigation Rule)." North Carolina Department of Environmental Quality.
- ²³ North Carolina General Statutes Chapter 143. State Departments, Institutions, and Commissions §143-214.11. Division of Mitigation Services: Compensatory mitigation.
- ²⁴ Clower, T. & Weinstein, B. (2012, revised January 2015), *Update of the Economic, Fiscal, and Development Impacts of the Proposed Lower Bois d'Arc Reservoir Project*.
- ²⁵ US Army Corps of Engineers, (2017). "Proposed Lower Bois d'Arc Creek Reservoir, Environmental Impact Statement (EIS) USACE PROJECT NUMBER: SWT-0-14659." Tulsa, OK: US Army Corps of Engineers Tulsa District Website. Retrieved from <https://www.swt.usace.army.mil/Missions/Regulatory/Tulsa-District-Environmental-Impact-Statements/>.
- ²⁶ Coastal Protection and Restoration Authority of Louisiana. (2017). *Louisiana's Comprehensive Master Plan for a Sustainable Coast*. Baton Rouge: State of Louisiana.
- ²⁷ US Department of Justice, (2015, October 5). "U.S. and Five Gulf States Reach Historic Settlement with BP to Resolve Civil Lawsuit Over Deepwater Horizon Oil Spill." [Press Release] Retrieved from <https://www.justice.gov/opa/pr/us-and-five-gulf-states-reach-historic-settlement-bp-resolve-civil-lawsuit-over-deepwater#:~:text=On%20Jan.,billion%20for%20natural%20resource%20restoration>.
- ²⁸ Environmental Policy Innovation Center, "An Analysis of Outcome-Based Performance Contract Bids and the Coastal Protection and Restoration Authority's Response." 5 November 2019. Here are the three key findings, verbatim:
- "First, CPRA staff with years of experience in other forms of contracting simply have a cultural bias against this new form of contracting which is perceived to give government employees less control over projects. This kind of cultural resistance is common in similar initiatives across the country to use results-based contracting in both environmental and social programs. The reaction is understandable, but often misplaced, as companies that do results-based contracting have a strong incentive to work closely with the agencies that pay them because they want to be competitive in future contracting opportunities. Instead of doing paperwork, government staff retain many informal and consultative roles on projects that are critical, but it can be hard to see this in the written materials associated with contract solicitations.
 - "Second, we believe there are ways that CPRA has missed or undervalued real risk reductions provided by this form of contracting to CPRA and the public it serves. This includes the value of accelerating by 2-3 years these and dozens of future projects under Louisiana's coastal restoration master plan. It includes the risk reduction associated with the final 20 percent performance payment at Year 5 that no previous CPRA project faced, in addition to an extended guarantee that restoration work will continue to perform to a high standard more than 20 years after construction is complete.

- “Third, we believe there are aspects of the contract solicitation for projects that created unintentional costs and unnecessary risk transfer and that CPRA probably did not intend to have the effect they had on bidding. For example, the “clawback” provisions putting the remaining 80 percent of construction costs into the contract as a penalty for poor performance is likely unnecessary and costly. It is unnecessary because contractors already have an incredibly strong incentive to meet the performance contract standards simply with the 20 percent of the construction payment that is tied to marsh restoration success.”

²⁹ Royal Engineers & Consultants, LLC. (2019). *Outcome Based Performance Contracting Findings and Recommendations Report*. Baton Rouge: Coastal Protection and Restoration Authority. The full list of recommendations, verbatim, are:

- It is important that the OBPC program be predicated on utilization of out-year funds that are not otherwise allocated to projects. There is little advantage for CPRA to use existing funds for an OBPC project.
- DWH NRD should continue to be the primary funding source for OBPC. Other sources of funding could be used, but each of those sources comes with varying levels of funding stream uncertainty or are otherwise not ideal for OBPC. For example, the use of state surplus funds was discussed as a source for OBPC projects. However, it is not the intent of OBPC, nor is it advantageous for CPRA, to use existing one-time funding. Use of GOMESA funds could also be considered; however, these funds are limited relative to NRD funding, and GOMESA is CPRA's primary source of funding that can be used for risk reduction projects. Even if the GOMESA funding stream increases and can be predicted with relative certainty over many years, it is not ideal for OBPC as CPRA already has the authority to bond GOMESA funds. Bonding is not allowed for NRD. Because of the certainty associated with the DWH NRD funding stream, and the low-cost financing opportunities that this certainty provides CPRA access to, this funding source should continue to be used for OBPC projects.
- All OBPC expenditures should be based on a complete cash flow analysis for funds (i.e., NRD) that will/could be allocated to OBPC projects, accounting for projected expenditures for projects such as sediment diversions, etc. The total amount of out-year funding that has not been allocated should be identified as well as the amount CPRA would dedicate to the OBPC Initiative. This information would serve as the basis for establishing the OBPC project/program scope, schedule, and budget. Implementation of OBPC should be programmed so that availability payments are fully synchronized with the funding stream.
- OBPC should be framed as a Program to stimulate interest from the greatest number of proposers/financiers. CPRA will in effect be creating a new market for ecosystem restoration finance.
- Projects should be large enough, from a total cost perspective, to ensure appropriate economy of scale, and therefore value to the state, as well as to ensure they provide regional benefits.
- Specific project areas should be identified for OBPC implementation. CPRA has advanced beyond simply building projects where they are convenient or cheapest; projects are now being built in strategic locations as part of the integrated coastal protection program and CPRA Master Plan. Allowing proposers to identify project locations leads to bidding wars for land rights, difficulty in comparing project proposals, and increased cost to proposers having to identify project areas. Furthermore, allowing proposers to select project areas across a wide geographical area (e.g., a basin) complicates and delays implementation relative to the LA TIG, which must initiate and complete the lengthy restoration planning process from the beginning for each new project location.
- CPRA should utilize existing LA TIG approved project areas, within CPRA Master Plan polygons, in order to simplify the Restoration Planning process. Specifically, there are potential project areas identified in LA TIG restoration planning documents that can be utilized for OBPC in the Terrebonne, Barataria, and Pontchartrain basins. Doing this would greatly reduce the complexity of the Restoration Planning process (i.e., CPRA would be assured of project acceptability by the LA TIG). Alternatively, if projects are identified that do not have supporting approval documents, restoration planning should be initiated immediately.
- CPRA must acquire all necessary land rights and oyster leases for the projects using standard CPRA policies and procedures. Doing this will ensure that the OBPC Program does not negatively affect future CPRA land rights or oyster lease acquisition and will not add time or risk to the project as it should be completed prior to project solicitations.
- CPRA should identify the borrow area to be used for each project. This reduces cost and uncertainty to proposers and allows CPRA to appropriately sequence the use of limited renewable sediment resources. This also allows control of the borrow area template to ensure it is being utilized most efficiently with respect to future use by other projects.
- Permitting should be handled by the proposers. This is an area which proposers have indicated that they can accelerate the process and achieve time savings.
- Project performance and commencement of availability payments should be based on acceptance of as-builts at construction completion. This will equalize the risk of project performance between DBB and OBPC and will reduce project cost by not imposing risk to contractors that CPRA does not bear. This will also lower project costs by obviating complex out-year performance monitoring expenses, avoiding issues with complicated out-year performance penalties, and eliminating the need for a clawback provision. Furthermore, this does away with force majeure issues (e.g., a single tropical storm impacting the site) post construction that would certainly confound the evaluation of project performance.
- Proposers should be required to finance the project 100% through construction completion. This will increase the cost of financing; however, paying contractors for preliminary design and final design (as was proposed in the initial RFP) and at milestones during construction (as some have suggested) is more akin to design build than OBPC as no meaningful outcomes have been achieved prior to construction completion. The suggested approach does resemble the Design, Build, Finance (DBF) alternative delivery process. However, it remains in the realm of OBPC in that no payments are made until the project is delivered in a satisfactory manner (i.e., the outcome is achieved), and availability payments are made over time as opposed to full payment at as-built acceptance. Furthermore, CPRA does not have explicit statutory authority for DBF; so, OBPC is currently the most viable mechanism for alternative delivery of CPRA projects.

- In order to accept performance and begin guaranteed payments after project construction, CPRA must embed personnel with the OBPC team during design and construction. This will provide ongoing acceptance of the project, and the contractors will not be at risk for any out-year performance issues that were not foreseeable by CPRA. This approach may marginally extend the project schedule due to added levels of review and approval; however, it is the only way to equalize performance standards and costs between OBPC and DBB.
- The maximum score for each criterion in the scoring rubric should be reflective of the value that CPRA places on that criterion (i.e., the criterion that CPRA values the most should have the highest maximum score). This could include a reduction in the cost/acre score, an increase in the technical approach score, a score for the type and cost of financing, or a combination of these and other modifications. Further, the description of how each of the proposal evaluation criterion will be scored should leave no ambiguity as to CPRA's intent.
- Proposers should be required to provide a break-out of key pricing components to facilitate accurate comparison of costs to DBB. As a publicly funded project, CPRA has the full right and authority to request detailed financial information including projected profit. Understanding key pricing components will also enable CPRA to conduct a robust/accurate VFM analysis to understand and justify any cost differential between DBB and OBPC.

³⁰ Louisiana House of Representatives. (2020, February 19.) Presentation by Royal Engineers & Consultants LLC of Outcome Based Performance Contracting: Findings and Recommendations Report to Louisiana House of Representatives. [Videorecording] Retrieved from https://house.louisiana.gov/H_Video/VideoArchivePlayer?v=house/2020/feb/0219_20_CPRA

³¹ Gulf Coast Ecosystem Restoration Council. (n.d.) "About the RESTORE Act." RestoretheGulf.gov. Retrieved from <https://www.restorethegulf.gov/history/about-restore-act>

³² La. R.S. 49:214.6.2 and La R.S. 49:214.7.

³³ CPRA, (2019). "Outcome-Based Performance Contracts to Develop and Deliver Large-Scale Marsh Creation Projects: RFP No. 2503-19-06.

³⁴ National Oceanic and Atmospheric Administration, (2020, July 2020). "Louisiana Trustees Approve Massive 1,200-acre Marsh Restoration Project in Barataria Basin." Gulf Spill Restoration website maintained by NOAA on behalf of the Deepwater Horizon Natural Resource Damage Assessment Trustees. Retrieved from <https://www.gulfspillrestoration.noaa.gov/2020/07/louisiana-trustees-approve-massive-1200-acre-marsh-restoration-project-barataria-basin>.

³⁵ Maryland Department of the Environment, (October 2000, Revised May 2009). "Chapter 3: Performance Criteria for Urban BMP Design" in *Maryland Stormwater Design Manual, Volumes I and II*. Retrieved from <https://mde.maryland.gov/programs/Water/StormwaterManagementProgram/Documents/www.mde.state.md.us/assets/document/chapter3.pdf>.

³⁶ Environmental Protection Agency, (n.d.). "Financing Green Infrastructure - Is a Community-Based Public-Private Partnerships (CBP3) Right for You?" USEPA. Retrieved from <https://www.epa.gov/G3/financing-green-infrastructure-community-based-public-private-partnerships-cbp3-right-you>.

³⁷ Clean Water Partnership. (2016). *Prince George's County's Approach to Meeting Regulatory Stormwater Management Requirements*. Prince George's County Department of the Environment Stormwater Management Division. Retrieved from <https://www.princegeorgescountymd.gov/DocumentCenter/View/23474/PGC-CBP3-Clean-Water-Partnership>.

³⁸ Prince George's County. (2013). "Request for Qualifications: Urban Retrofit Program Public Private Partnership." BID NO. S13-083. Prince George's County. Retrieved from <https://thecleanwaterpartnership.com/wp-content/uploads/2016/08/RFQ-S13-083-SW-Urban-Retrofit-Program-P3.pdf>.

³⁹ Corvias. (2019). *Clean Water Partnership Year 3 Progress Report*. The Clean Water Partnership. https://thecleanwaterpartnership.com/wp-content/uploads/2019/01/CWP_Progress_Report_Year-3-FINAL.pdf.

⁴⁰ Quantified Ventures. (n.d.). "DC Water: First Ever Environmental Impact Bond." Quantified Ventures. Retrieved from <https://www.quantifiedventures.com/dc-water>.

⁴¹ EPA (2005) Consolidated Civil Action No. 1:00CV00183TFH. <https://www.dewater.com/sites/default/files/Long-term%20Control%20Plan%20-%20Consent%20Decree.pdf>.

⁴² EPA (2015) First Amendment to Consent Decree. Consolidated Civil Action No. 1:00CV00183TFH. <https://www.dewater.com/sites/default/files/Long-term%20Control%20Plan%20-%20Consent%20Decree.pdf>.

⁴³ Zwick, Steve. (2012, May 4). "Philadelphia Taps Stormwater Fees to Finance Green Infrastructure." Ecosystem Marketplace. Retrieved from <https://www.ecosystemmarketplace.com/articles/philadelphia-taps-stormwater-fees-to-finance-green-infrastructure/>.