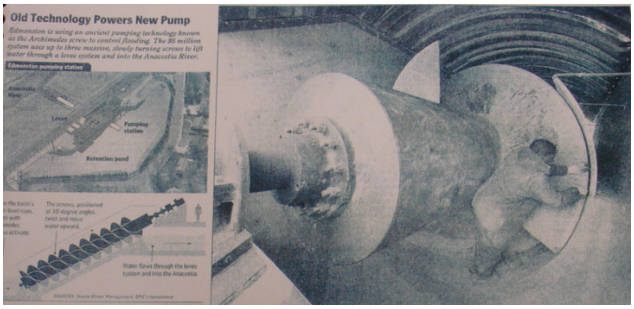
Maryland Association of Floodplain and Stormwater Managers

Our MAFSM Conference Field Tours

Edmonston Maryland

Friday, October 22 10:00 – 12:00

ARCHIMEDES SCREW Stormwater Pumping Station
Tour 1 (starts at 10:00 am)



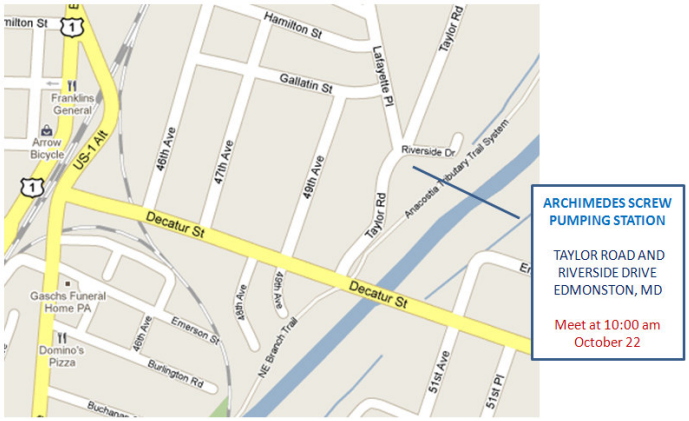
Learn about the unique and interesting Edmonston Pumping station and learn how an ancient pump design is protecting homes from flooding.

EXPERIMENTAL WETLANDS Project
Tour 2 (starts at 11:00 am)

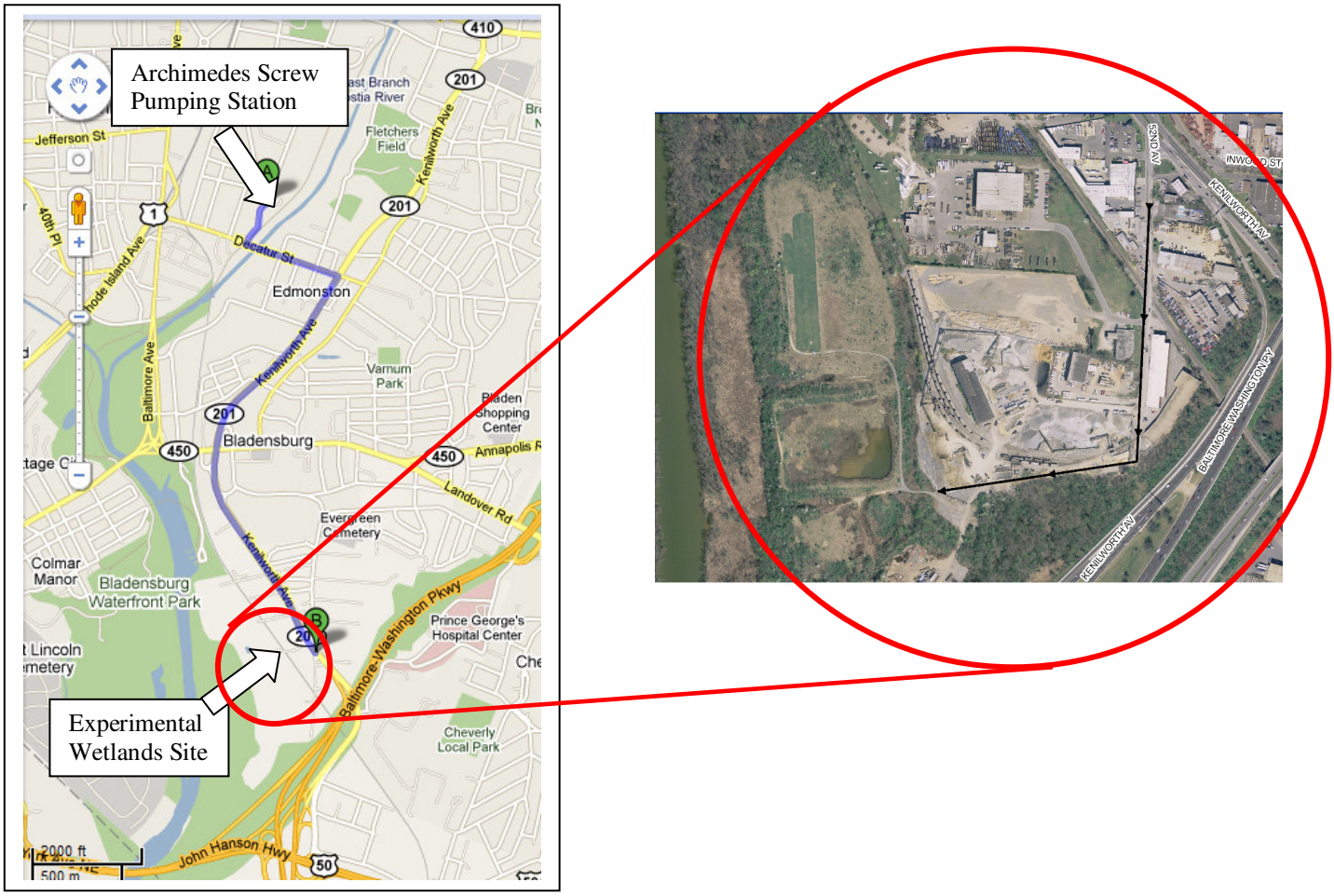
Visit a wetlands restoration experiment still growing and helping to provide needed floodplain storage.

Both tours cost a total of $20 per participant and you get 3 CEUs and a MAFSM cloth tote bag… Wow !!!

Maps to locate the Tours…



Edmonston, Archimedes Screw Pumping Station
Starts at 10:00 am on Oct 22nd



Experimental Wetlands site location, near tag labeled 'B'
Starts at 11:00 am on Oct 22nd

"Pump It Up and Out"

Prince George's County, Maryland Utilizes Three Archimedes Screw Pumps to Solve Severe Flooding Problems

By Mike Rossi and David Rigby, Waste Water Management, Inc.

The Edmonston Stormwater Pump Station is located in the Town of Edmonston in Prince George's County, Maryland. Because the drainage area have become completely developed with high density commercial, industrial and residential uses the existing pump station has long ago been unable to keep up with the high intensity storm flows reaching the stormwater retention pond. In recent years, severe flooding of nearby homes and properties has occurred as a result. Following two particularly severe floods in 2004, the Prince George's County Department of Public Works and Transportation (DPW&T) commenced the Edmonston Stormwater Pump Station Improvements project. The station upgrade included three new Archimedes screw pumps each 10' in diameter and 50' long, each capable of pumping 137 cubic feet of water per second.

WATERSHED CHARACTERISTICS

The Washington DC metropolitan area is subject to over 40" of rain per year. The State of Maryland Stormwater Design Manual tabulates the 24 hour rainfall depths associated with the 1, 2, 10, and 100 year storm events as 2.7 inches, 3.3 inches, 5.3 inches, and 7.4 inches, respectively for Prince George's County. Rainfall intensities are relatively high. For example, Intensity Duration Frequency curves for nearby Arlington County, Virginia, immediately across the Potomac River from Prince George's County, Maryland, report that a 10 year storm event has an intensity of 5.0 inches per hour for a duration of 15 minutes.

The Edmonston Stormwater Pump Station is located on the west side of the Anacostia River and serves a drainage area of 0.72 square miles. The pump station has a 52,000 square foot retention pond providing approximately 365,000 cubic feet of storage. Influent culverts include 66" and 27" diameter pipes and 5'x11' and 4'9"x10' box culverts. The original pump station constructed in 1957 by the Corps of Engineers has two 75 horsepower pumps each capable of pumping 50 cfs through two 5'x8' effluent box culverts to the Anacostia River. With the bottom of the pond invert elevation of 6.80' MSL, the pump start elevation of 12.00' MSL and a top of pond elevation of 15.40' the pond would get approximately 2/3 full before the pumps would start. Figure 1 is a aerial image rendering showing the Anacostia River, the retention pond, and the pump station.

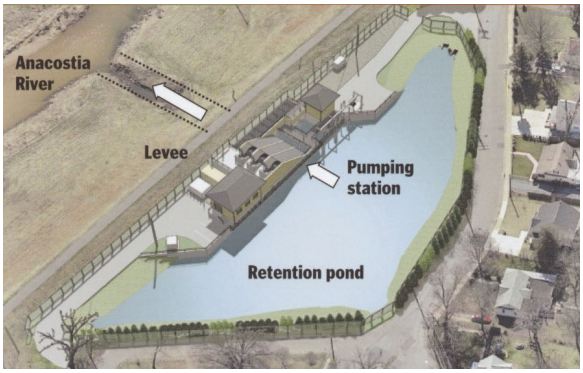


Figure 1 – Aerial Image Rendering of Pump Station and Adjacent Area

STATION DESIGN AND PUMP SELECTION

In 2005, the DPW&T retained Waste Water Management, Inc. of Falls Church, Virginia to design the upgrade. Working closely with the DPW&T, Waste Water Management, Inc. determined that Archimedes screw pumps would be ideal for the upgrade. Advantages of Archimedes screw pumps include capability of pumping debris, relatively slow speed making them less subject to wear and abrasion, no net positive suction head required ($NPSH_{req}$) providing a capability of running dry, and the cost savings associated with not having pipes and valves to operate and maintain. The fact that the pumps could run dry was the most important consideration because it allowed the pumps to turn on when the retention pond water surface elevation (adjustable setpoint) was only a few inches above the box culvert invert elevation, rather than 6' above it as was required by the original axial flow pumps due to their $NPSH_{req}$. While other types of pumps could have been used, a deep wet well would have been required which would have been problematic due to the proximity of the levee, the presence of groundwater and the low quality subsurface materials. Figure 2 shows a cross section of the screw pump design. The "touch point" of each screw pump is at an elevation below the effluent culvert invert elevation allowing the pumps to drain the pond completely.

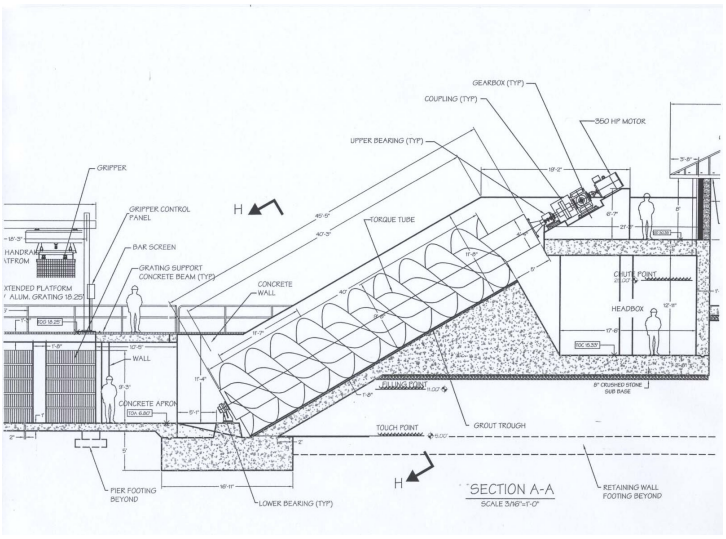


Figure 2 – Cross Section of Screw Pump

Older screw pumps utilize grease pumps and piping systems to lubricate the lower bearings which are often submerged. The Edmonston screw pumps are equipped with lifetime lubricated lower bearings. This feature eliminates the possibility of grease entering the Anacostia River due to grease piping failure. It also eliminates the problem of spent grease disposal.

The Edmonston project also incorporated an automatically cleaned bar screen system that reduced the amount of trash and debris passing through the pump station. The pump station has a system of highly illuminated catwalks and platforms allowing personnel to visually assess the operation of all station components.

The DPW&T worked closely with the Town in the selection of the façade and roofing materials and more than 120 new trees and shrubs were added to the site making it aesthetically pleasing when viewed from either the neighborhood or the jogging trail on top of the levee. Figure 3 shows the new screw pumps (under green fiberglass covers) next to the original pump house (far right).

Figure 3 – New Screw Pump Structure and Original Pump House

OPERATION

The retention pond and the Anacostia River are essentially decoupled systems. That is, storm events causing high stage in the Anacostia River are not necessarily the same events that would cause inflow to the retention pond. Under low river conditions, runoff in the watershed passes through the retention pond and out to the river through an existing box culvert passing through the levee. On a rise in river stage above the invert elevation of the effluent box culvert, gravity flap gates and electrically actuated sluice gates close to keep river water out of the retention pond. Should the retention pond rise due to storm events in its watershed, the screw pumps will turn on pumping water up to an elevation above the top of the levee, discharging to an effluent channel which drops into the existing box culvert on the pond side of the levee, downstream of the sluice gates. This design allowed the levee and associated top of levee trail to remain undisturbed. Figure 4 shows two screw pumps and the retention pond.

Figure 4 – View of Retention Pond from Discharge Channel

The project was substantially completed in December 2007. Installation of the emergency generator, which had an 18 month lead time due to Hurricane Katrina backlog, was installed in the summer of 2008. On February 1, 2008 the region received 2.05" of rain and on May 11, 2008, the region received 2.63" of rain and while flooding was severe throughout the Washington DC metropolitan region and in Prince George's County, the Edmonston pump station performed as designed and the Town and its residents stayed dry.

Successful EPA, County, MNCPPC and SHA Partnership
Creates Largest Wetland Project in Prince George's County on the Embattled Anacostia.

As part of the environmental mitigation components of the Woodrow Wilson Bridge construction project, the 25-acre wetland creation undertaking sits along side of the Anacostia River just south of the Bladensburg Waterfront Park on M-NCPPC owned land known as the "old pistol range" or Millvale Quarry. DER provided approximately $3.5 million funding (mostly through EPA Earmark grant funding to DER) toward the project. The following table shows the cost contribution to this project:

EPA Grant Funding	$2,600,000
County (DER)	$ 900,000
State (SHA)	$6,100,000
Total	$9,600,000

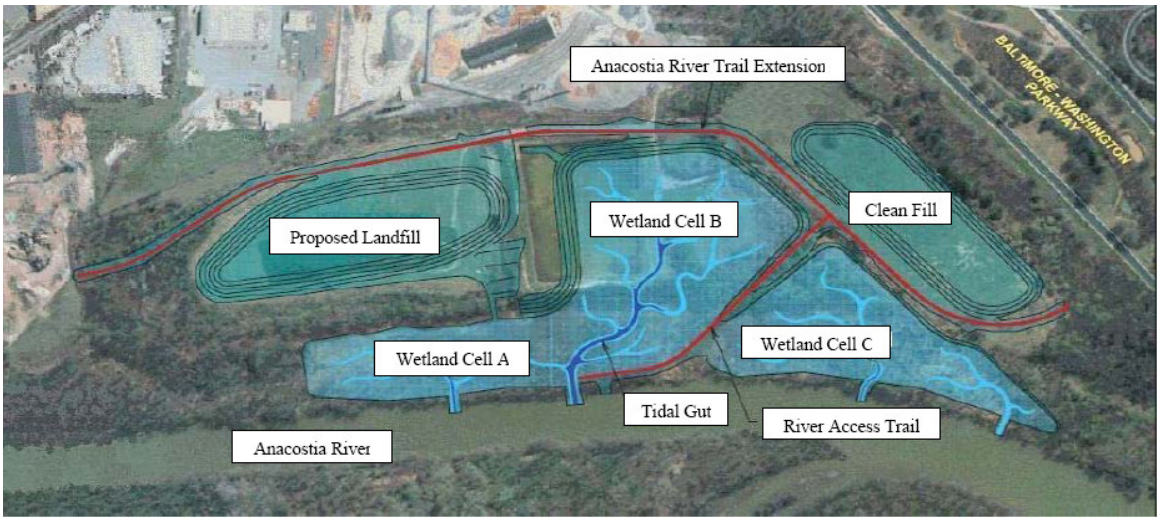
Stands of cardinal flower in bloom on the wetland creation site along the Anacostia River.

In the 1950's and 60's, the place was used for an unregulated landfill. Tons of trash and construction rubble buried on the property. When the Maryland State Highway Administration (SHA) approached the M-NCPPC nearly ten years ago, for a mitigation project site due to environmental impacts of the Wilson Bridge construction, this site was a perfect fit. The preliminary design was completed in early 2000s; but the estimated cost is far more than what SHA had in the budget. With the additional needed funding provided by DER, the project moved to final design. EA Engineering of Baltimore "engineered" the wetland site into four distinct cells, and using aerial photography from 1938 that the M-NCPPC provided, the partnership set out to recreate a marshland similar to what previously existed before the land was filled with trash and overwhelmed by the industrial uses.

Construction of the wetland area started in May of 2007. Nearly 330,000 cubic yards of earth was moved to create the new marshland with almost half that amount being buried trash. This spring SHA contractors installed approximately 85,000 wetland plants (see the figure above) and miles of goose exclusion fence to protect the new planting from goose herbivory. The new plant community was designed to provide a thick cover of typical wetland plantings. It also includes species long gone from the Anacostia River eco-system including the American Lotus and wild rice.

Along with the new natural setting, the site was designed to contain a portion of the Anacostia River Trail. The new trail will eventually connect north to the Bladensburg Waterfront Park and south into Washington, D.C. Construction is expected in 2010. When completed, users will be able to travel from Wheaton Regional Park via the trail system to the National Mall.

Out of the $2,600,000 grant funding from EPA, approximately $700,000 is allocated for studying the environmental benefits of this wetland. The study includes a detailed water quality, biological, and physical monitoring program and an in-depth computer modeling effort. EA Engineering again was hired to perform this task. The project started in October 2009 and will be completed in October 2011.



Wetland Creation

Site