FALL 2011

Pittsburgh ENGINEER

Quarterly Publication of the Engineers' Society of Western Pennsylvania

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In this issue...

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Guest Editor

The Role of Pittsburgh's Waterways in Shaping Our Region

James R. McCarville
Executive Director
Port of Pittsburgh Commission

"Pittsburgh nurtured the industrial revolution through its creative and entrepreneurial engineering community. Founding members of ESWP in association with informed political leadership led the waterways engineering that supported the industrial and economic growth of the Pittsburgh region. Pittsburgh's engineering community can claim a legacy of imaginative and creative solutions for the betterment of Southwestern Pennsylvania. We must bolster that legacy, work with our elected officials and once again attack the challenges of the 21st century." – Jerry Dettore

Pittsburgh's waterways continue to play a vital role in shaping our region and our economy. Besides the obvious beauty and important role the three rivers played in our history, our waterways move commerce, provide jobs and give a unique identity to our region. The natural draft of our rivers, and much of the Ohio River, is only about 18 inches. In fact, General Braddock twice marched his army across the Monongahela River during the attack on Fort Duquesne. And, until the late 1800's the depth of the rivers here was unpredictable, and not always suitable for shipping goods. Beginning in 1885, design and construction of a lock and dam system to create year-round navigable pools, resulted in our region becoming a major inland port. The first set of locks and dams to deepen and stabilize the river pools, were completed in the late 19th century and then rebuilt in very difficult economic times during World War I and the Great Depression. The current lock and dam system reflects the infrastructure investment of generations that believed strongly in the country's future.

The Waterways edition of *Pittsburgh ENGINEER* highlights how our locks and dams add jobs, value and vitality to Western Pennsylvania's economy, environment and quality of life. The Port of Pittsburgh Commission is excited to have the opportunity to share our story about infrastructure needs and future technological improvements to keep our rivers in working order. River infrastructure made it possible for western Pennsylvania to become the North American center of the second industrial revolution, combining technological advances in steel, chemicals, and electricity with the internal combustion engine and the river transportation of large volumes of ores and minerals. Stable pools of water behind the dams also made it possible to provide a large population with water for drinking, irrigation and disposal of wastes by assimilation. Waterways infrastructure has also provided abundant recreation opportunities vital to our enjoyment and quality of life.

We take these functions for granted today; but they are vulnerable. Like most of the nation's aging infrastructure locks, dams and other river facilities face engineering and challenges and severe financial hurdles. It is very costly to simply maintain the system. However the region and nation will incur serious consequences if waterways facilities are not maintained and improved.

We owe the entire lock and dam system to the foresight of earlier generations, past federal investment and the U.S. Army Corps of Engineers (USACE). We cannot continue to expect to thrive and make progress based on investments from the early 20th century. It is our time to safeguard the value of the waterways for generations to come. But, the prospects for reinvestment are not promising. We got a peek at a very bleak future on October 1, 2011. On that date, the USACE, lacking sufficient funds to operate the entire system for the fiscal year, put the Upper Allegheny Locks into "caretaker" status. They further indicated that they might not have funds to make repairs, even emergency repairs, on portions of the Middle Allegheny. Although the Upper Allegheny carries little commercial traffic, it will impact all other beneficiaries. With continuing budget cuts, we can expect to see additional closures, or "caretaker" status for locks that carry significant commercial traffic.

The pages in this special Waterways edition document lock and dam issues and offer solutions for financing and for new technologies. These solutions can provide vital and viable waterways for the 21st century. Importantly, they will generate jobs from design, engineering and construction to waterways operations and related employment at numerous commercial facilities which rely on the river transport supply chain.

Please take some time to explore the issues and possibilities of our waterways, as you enjoy this issue of *Pittsburgh ENGINEER*.

PE

Patchwork Repairs: The Effort to Prevent Failure

By Jeff Hawk

The US Army Corps of Engineers' Pittsburgh District maintains the oldest, largest and most fatigued lock and dam network in the nation's inland marine transportation system. Many of its structures are approaching an alarming tipping point where deterioration, inefficient funding and roughly $400 million in backlogged critical maintenance are converging to push the aging system to the brink of catastrophic failure. Nowhere is this more evident than at Montgomery Locks and Dam on the Ohio River and Elizabeth Locks and Dam on the Monongahela River, where the Corps has spent millions of dollars on temporary repairs.

Saving Montgomery

At Montgomery, the issue stems from deteriorated gates that are undermining the stability of the navigation dam.

"The dam gates are susceptible to catastrophic failure because there is a lack of structural stability due to extreme corrosion," said Mark Jones, the engineering division chief in Pittsburgh. "The district has used operations and maintenance funds to replace the obvious structural members in patchwork fashion but these do not address the underlying cause of corrosion."

"We're just buying time and patching things up five years at a time." -Don Fogel, Corps maintenance chief

"The failure of a gate or gates could concentrate the flows and erode the downstream riverbed material," said Buzz Stevenson, the district's dam safety branch chief. "That erosion could initiate a complete failure of the dam."

An in-depth inspection of the dam in 2006 concluded that all 10 dam gates were "in an active state of failure under normal hydraulic load." Two of the worst gates were "on the brink of catastrophic failure," stated the report. Corrosion had reduced some structural cross members by as much as sixty percent.

The deteriorated condition of the riveted connections could result in a "sunny-day failure," the report stated. But the more likely failure scenario involves ice loading or a breakaway barge. The report warned that the gates were "not capable of surviving a large horizontal ice thrust or a minimal barge impact." Furthermore, it stated that "multiple gates may fail under ice loading or multiple barge impacts resulting in uncontrolled river flow and potential loss of navigation on the upper Ohio River."

A Pittsburgh District maintenance worker watches/ steadies a rusty steel structural beam at Montgomery Lock and Dam. The district has spent $3.5 million on temporary repairs at Montgomery to keep the dam gates from failing.

On Oct. 18, 2006, the district sent a letter to its higher headquarters, the Great Lakes and Ohio River Division in Cincinnati, warning officials of the dire situation at Montgomery. Later that night, a barge strike at the Montgomery Dam punctuated the message. Around 10:30 pm, three coal-filled barges cut loose of their tow shortly after the motor vessel struck the lock's upper guide wall. One breakaway barge slammed into Gate 4, buckling it and rendering it inoperable. Another barge came to rest next to the Gate 4 pier. The third barge rammed Gate 8 causing it to collapse and dislodge completely from the dam.

The Corps worked to temporarily plug the hole left by the missing gate and address the seven-foot opening at the inoperable

A repair fleet worker welds new bolts onto a structural steel member at Montgomery Lock and Dam on the Ohio River. A Corps reported warned that the deteriorated condition of the riveted connections could result in a "sunny-day failure."

A stack of corroded structural steel members highlights concerns that the dam gates at Montgomery Lock and Dam would not survive a barge strike or heavy ice loads.

Gate 4. "Gate 8 was completely taken out and the river was flowing through it," said Don Fogel, the Corps' maintenance chief in Pittsburgh. "Had more gates been taken out, we would have lost the pool."

> *"Multiple gates may fail under ice loading or multiple barge impacts resulting in uncontrolled river flow and potential loss of navigation on the upper Ohio River." – from a Corps white paper*

According to a Corps report, "the Ohio River flow rate at the Montgomery Dam is equal to or less than one gate's uncontrolled flow capacity approximately 32 percent of the time in a given year." Thus, the loss of one gate could drain the pool. But the greater concern was the loss of many gates. "Controlling the upper Ohio River in a multiple gate failure scenario could be extremely difficult," stated the report, primarily because the district has only one maintenance bulkhead available to block one damaged gate.

A year after the strike, the Corps installed two newly fabricated gates at a cost of $8.3 million. The new gates are capable of withstanding a barge strike and ice loads but severe corrosion at the other gates still presents the possibility of a pool-draining incident. The Corps took heed of the 2006 inspection report and barge strike and implemented interim risk reduction measures, including updates to the facility's emergency action plan. Additionally, the district engineer's approval must be obtained before maintenance crews can work downstream of the fragile dam, said Jones.

The district also started an aggressive five-year maintenance cycle to remove and replace the accessible, most severely corroded structural members, starting with the worst gates. Crews replaced the rusted metal they could access, said Fogel. Removing the inaccessible major structural members was not an option because that might compromise the dam gates' stability and initiate complete failure, he added.

Between 2007 and 2011, the Corps spent $3.5 million on temporary structural repairs to bring the eight remaining gates to a safe and serviceable condition. In 2012, the repair fleet will start the cycle again. "We're back to an unsafe condition," said Fogel, noting the repairs are only estimated to last five years. "We're just buying time and patching things up five years at a time," he said.

The chance of obtaining funding for a permanent fix is a long shot. Although the Corps' Dam Safety Program rated Montgomery Dam as "urgent and very high risk," its failure, though economically impactful, would carry little risk to human life. Appropriately, the Corps' limited dam safety funds go to high risk reservoir dams where thousands of lives could be lost should a failure occur.

The other avenue for funding involves requesting a Rehabilitation Re-evaluation Report. The report would consider options for replacing the failing gates with new ones. Though there has been no study to estimate the cost for the rehab, the price tag could be in excess of $100 million, said Jeff Fritz, Pittsburgh District's chief of project management. But the study funds needed to calculate the cost estimate and recommend the fix are difficult to obtain when vying for dollars needed to address known critical maintenance issues across the system.

"We have to fix the things that are already broken before we can spend money on a report," said Fritz. And in these budget-tightening times, operations and maintenance dollars are becoming scarce. "The pot is growing smaller," he said.

Blowing Up Elizabeth

Project manager Steve Fritz would like nothing more than to see the 100 year-old, wooden piling built Lock and Dam 3 at Elizabeth, PA. blown to bits. It would punctuate the final act in a drama that has gone too long. Fritz manages the $1.7-billion Lower Monongahela River Project for the US Army Corps

The dewatered main chamber of Monongahela River Lock and Dam 3 at Elizabeth is heavily braced due to its questionable stability. The district has spent more than $7.3 million since 2006 to maintain the locks originally slated for removal in 2004.

Water pours from the 100-plus-year-old lock wall at the Mon River Lock and Dam 3 at Elizabeth, Pa. during a maintenance pump out of the auxiliary chamber. The navigation facility is the oldest in the district's inventory of 23 locks.

of Engineers in Pittsburgh. The project is a two-for-three improvement. It replaced a nearly 100-year old fixed-crest dam at Locks and Dam 2 at Braddock with a gated dam in 2004. It will eventually eliminate the Locks and Dam 3 at Elizabeth, but only after new locks are built at Dam 4 at Charleroi. The Corps is authorized to build two larger locks at Lock and Dam 4 at Charleroi but is currently only funded for portions of one lock. The final major milestone is removal of Elizabeth and adjusting the pool between Braddock and Charleroi.

"I hope I'm around to see it," said Fritz.

Originally scheduled for a 2004 completion, the Lower Mon River Project will now stretch out until 2023, even if it is efficiently funded. The project's funding history suggests that the date could be pushed to 2035, just two years shy of its 130th birthday. Constrained federal funding and the pending insolvency of the cost-sharing Inland Waterways Trust Fund have hobbled the project's progress and challenged the district to shuffle and re-shuffle the construction sequence at Charleroi locks. Delays have more than doubled the overall project's original cost estimate.

The Inland Waterway Trust Fund (IWTF) funds 50 percent of the federal capital investment in the inland waterways system. The Trust Fund collects a 20-cent diesel fuel fee from the tow industry to generate rehabilitation and recapitalization funds. It is inadequate to meet the needs of the system.

Built on wood pilings more than a century ago, Lock and Dam 3 on the Mon River has doubled its service life, though it has taken millions of dollars to keep it going.

"I hope I'm around to see it."
Steve Fritz, Corps project manager

So until detonation day finally arrives, the Corps must shore up and closely monitor the severely deteriorated, wobbly fixed-crest dam and sink funds into operating and maintaining the doomed locks at Elizabeth. Even though the Corps' Dam Safety Program has rated Elizabeth Dam as "critically near failure", it has no choice but to stabilize it.

The resulting temporary dam safety work at Elizabeth cost $4.7 million. Since 2006, the Corps has spent additional funds on critical maintenance to keep the lock operable. Crews refurbished emptying and filling valves, miter gates, and other major components to the tune of $7.3 million. Routine operations and maintenance of the facility costs the Corps $1.6 million a year, for a lock and dam that shouldn't be there anymore.

But failure or closure is not an option. Charleroi, Braddock and Elizabeth facilities experience the highest volume of traffic on the Monongahela River Navigation System and the pools they create provide industrial and municipal water supply. Recreational boaters also frequent the locks. The loss of Elizabeth Dam or breakdown of the locks alone would choke off 20 million annual tons of commodities, primarily coal used to generate electricity and supply

Pittsburgh District maintenance workers pump out the auxiliary lock chamber ahead of scheduled repairs to the aging, pre-World War 1 facility. The Corps planned to remove the structure in 2004.

the nation's largest coke plant.

Once complete, the Lower Mon River Project benefits are estimated to be more than $220 million per year. Benefits are generated by shipping bulk goods via barge as opposed to shipping by rail or truck. By reducing the transportation costs of coal, for example, power suppliers that use coal to produce electricity are able to provide it at a lower rate, thus reducing the cost to customers. Additional benefits are derived from having less maintenance on old and unreliable facilities. Charleroi, Elizabeth and Braddock facilities are the oldest navigation structures on the busiest section of the Mon River.

River commerce also reduces the number of trucks on the roads, which lessens wear and tear on the local roadways; cuts vehicle emissions; and increases driving safety for the general public.

The removal of Elizabeth Lock and Dam alone will clear a choke point from the system, shorten the delivery time of vital commodities, and save fuel and labor costs by eliminating additional lockages. The question is not what benefits the project will provide but when will it provide them? PE

About the author...

Jeff Hawk is the Public Affairs Officer with the US Army Corps of Engineers, Pittsburgh. Jeff may be reached at 412-395-7501. All photos accompanying this article courtesy of US Army Corps of Engineers

Bringing Wireless Broadband to the Waterways:

A Concept, a Project and a Roadmap

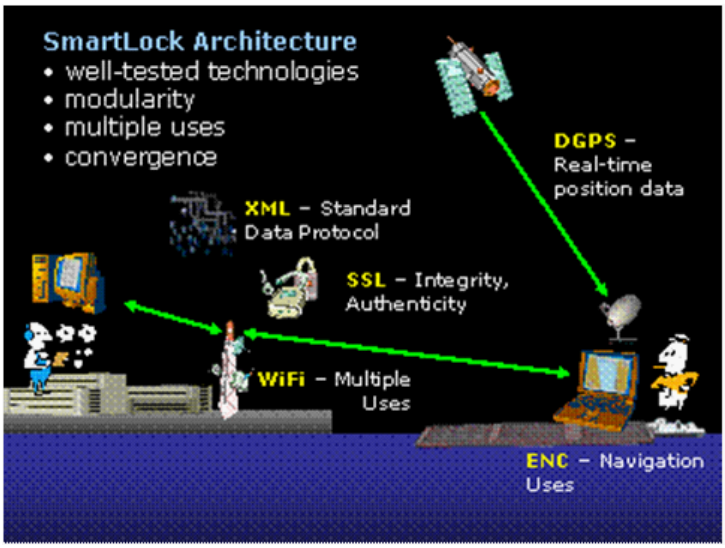
By James McCarville

The Concept

The Port of Pittsburgh Commission (PPC) is committed to promoting new technologies for the Inland River Waterway System. Inland waterway transportation is one of the oldest and most important industries in Pennsylvania. The work-process, however, has not changed much from what it used to be when the industry was first established. The PPC sponsored three Practicum Projects with students from Carnegie Mellon University (CMU). The three Practicum Projects were: SmartLock, RiverNet, and the Wireless Waterway. The PPC wanted to bring inland waterway transportation into the 21st century.

SmartLock

SmartLock is a locking system for Inland Waterway navigation. The system presents the pilot with essential, precise information in near real-time, including essential distances between the tow and the lock and conditions at the lock such as gate opening, river conditions, and wind conditions.



WiMAX Network Topology for SmartLock Architecture

It improves safety and efficiency by improving predictability and reliability at the lock. The largest sources of cost-savings facilitated by SmartLock are: allowing locking in fog, reducing accidents, and reducing the time it takes a tow to go through a lock. SmartLock presents the pilot with all information overlaid on an electronic navigation chart. In addition to basic navigational aid features, it can be extended to provide data collection capabilities, training, and guidance modules for pilots unfamiliar with a given lock and allow pilots to review their most recent lockages. Finally, using Internet standard WLAN wireless technologies for transmissions of river conditions data will also allow towboat operators to access the Internet using wireless technology.

RiverNet

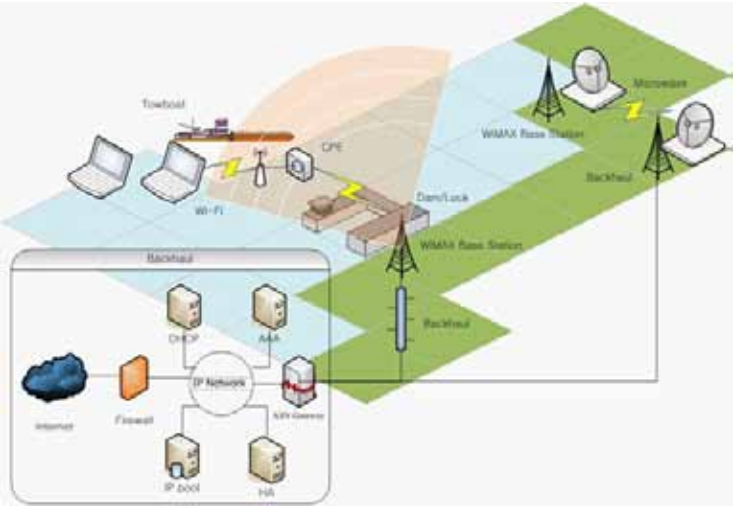
Our second project with CMU was River-Net. This project was an opportunity to address the information flow within the waterways industry. The students paid attention to the lack of communication and the inability to share information among the stakeholders. To eliminate those inefficiencies and to promote commercial waterway transportation, the research recommended a network infrastructure that would reinforce communication channels among stakeholders involved and proposed a concept of business applications that would improve the waterway transportation operations and work processes. While we were unable to build a network, our initiatives did encourage the USACE to develop digitized locations all along the river for facilities, vessels and commodities. In addition, they began developing a Lock Operators Manual (LOMA) for operating in a digital environment.

The Wireless Waterway Project

The purpose of this project is to solve a communications problem on the inland waterway system and to design the hardware and network infrastructure needed to develop a Wireless Waterway with intention of promoting safety, security and productivity in the inland waterways. The system will provide applications to meet the needs of our diverse stakeholders. The PPC was awarded funding through the Port Security Grant Program (PSGP) and the Allegheny County Economic Development Department to develop the Wireless Waterway. It expects to build out a test bed network with the funding provided. In addition to the navigation industry, the test bed network will be able to serve river terminals, private industries located on the river, public safety departments, and environmental agencies. The test bed is expected to link the three locks that form the Pittsburgh pool: Emsworth Lock and Dam on the Ohio River; Allegheny Dam 2 on the Allegheny River; and the Braddock Lock and Dam on the Monongahela River. It is anticipated that a contractor will design, build, operate and market the development of the network and test bed.

The Road Map

As a first step, the PPC will develop baseline tests. They will invite the USACE, the USCG, MARAD, the National Weather Service, the PA Dept. of Environmental Protection Agency and other government, private and non-profit interests to test the system. Our vision and hope is that this system will be extended



WiMAX Network Topology

throughout our nation's inland waterway system, improving communications, safety, and reliability for an industry looking to move forward with these technological advances. PE

Waterways Trivia

Collected by Sandie Egley

- Pittsburgh holds the key to the waterways by operating 23 locks and dams along the Allegheny River, the Monongahela River, and the Ohio River - *Col. Graham*
- True or False: the Port of Pittsburgh the busiest inland waterways port. (False – Second) *Jim McCarville*
- The Allegheny River has 72 miles of water navigation and includes 8 locks and dams reaching from Pittsburgh to East Brady, PA - *Col. Graham*
- The Monongahela River navigates 128.7 miles and has 9 locks and dams reaching to Fairmont, WV - *Col. Graham*
- The Ohio River navigates 127.2 miles of river downstream to New Martinsville, WV, with six locks and dams along the way - *Col. Graham*
- What is the primary cargo in the Port of Pittsburgh? Answer: Coal. *Jim McCarville*
- There are approximately how many recreational boats that use the waterways in Pittsburgh? Answer: 30,000! - *Commander Timme*
- The locks and dams system is necessary for year-round transportation because it maintains a constant channel in which the river depth is maintained at How many feet? Answer: 9 feet - *Col. Graham*
- Pittsburgh is bursting with bridges. How many are in Pittsburgh? Answer: 446 (*Wikipedia*)
- This is the oldest steel bridge in the United States (Hint: it spans the Monongahela River connecting downtown Pittsburgh to Station Square) Answer: The Smithfield Street Bridge. (*Wikipedia*)
- Because the Ohio River flows west, Pittsburgh became the debarkation point for pioneers heading for the frontier, earning the city what nickname? Answer: The Gateway to the West. (*Wikipedia*)
- According to Terry Wirginis of the Gateway Clipper, more than 25 million passengers have sailed with the fleet during the last 51 years, making the Gateway Clipper Fleet the number one non-sports attraction in the city
- In 2003 Fish and Boat Commission reported that the record catch in the Allegheny Reservoir for a Northern Pike was how many pounds? 35 lbs. (caught by Carl Stoltz of Bradford, PA) *Source: Fish and Boat Commission*
- Pennsylvania is a diverse state with a wide variety of fish. How many types of fish are in the waters in PA? (Answer : 90) *Source: Fish and Boat Commission*

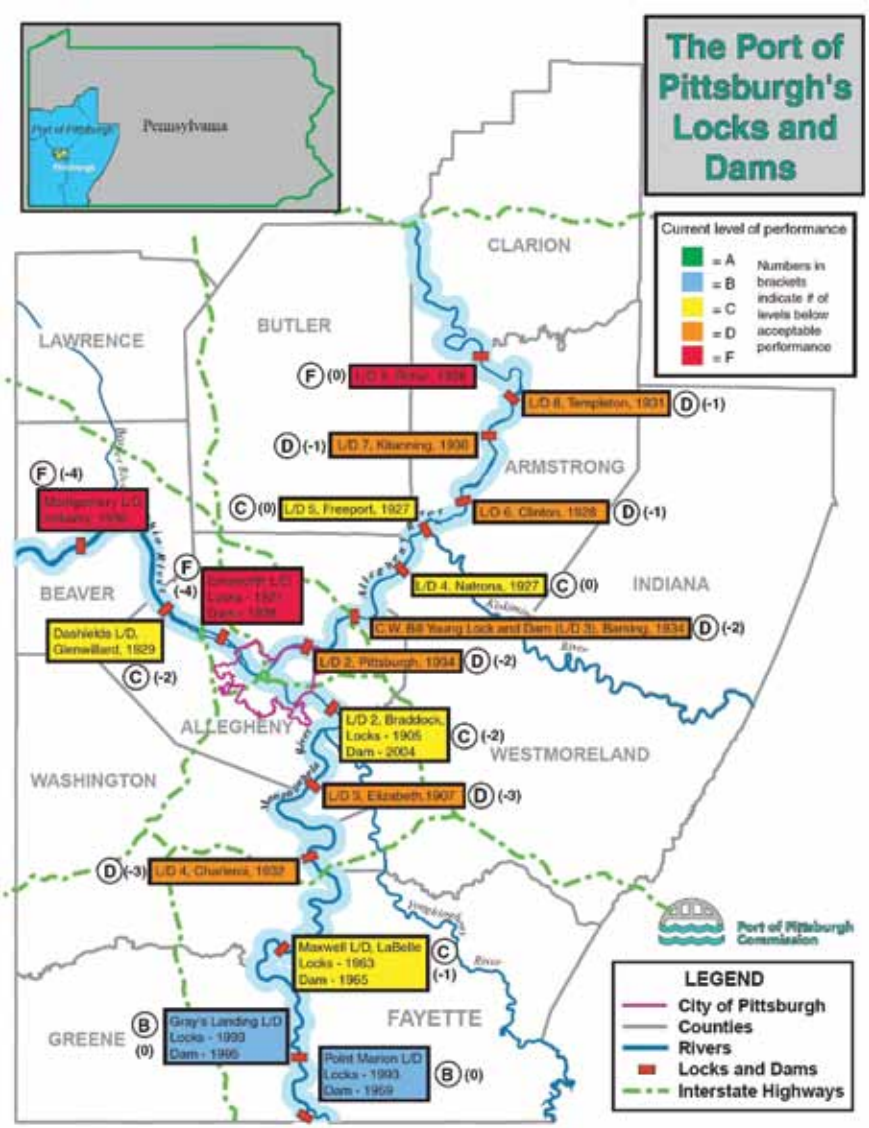
Editors Note: Thanks to Colonel Graham of the USACE Pittsburgh; Commander Timme of the USCG Pittsburgh, Terry Wirginis of the Gateway Clipper Fleet, the PA Fish & Boat Commission, and of course, Jim McCarville for their contributions.

What Do Locks and Dams Do?

By Jim McCarville with Barbara McNees, Larry Bray, Kari A.Mackenbach, and John C. Bryan III

There are 72 sets of locks of dams on the "Ohio River Basin and its Tributaries" (ORT), 17 sets of locks and dams in this system are located in western Pennsylvania. Each maintains a stable pool with a minimum depth of nine feet of water. Because the dams create stable and reliable pools:

- Locks pass vessels from one level to the next, as regulated water descends from mountains.
- River terminals transfer cargo to-and-from barges, factories and power plants.
- Water supply facilities have river intakes and convert water to drinking quality
- Sewerage systems flush treated effluent water back into rivers for assimilation.
- Industries cool plants that generate power and those that make materials and products.
- Riverfront property increases in value.
- Boaters dependably fish, ski and recreate.
- Bicyclists, hikers and campers enjoy some spectacular scenery.
- Even in droughts, stable pools provide water for drinking, fighting fires and irrigating crops



A total of 829 counties get power from electric utilities with generating plants located on the ORT system. A University of Tennessee Center for Transportation Research (UTCTR) study found that, coupled with significant shipper savings along the ORT and power plant efficiencies, the Ohio River system realizes an annualized economic impact of $17.4 billion in sales.

The systems strengthened and reliable stream flow generates safe and non-polluting hydroelectric power. Hydropower is produced by the U.S. Army Corps of Engineers (USACE) and by non-federal producers at USACE facilities. Seventy-five Corps hydropower plants generate over $4billion in gross annual revenue. The Tennessee Valley Authority (TVA) hydropower generation produces approximately $1 billion more.

Who Benefits?

The people of Western Pennsylvania, and all those living along the ORT system, realize the many benefits of our lock and dam infrastructure. The ORT has a total of 72 federally owned sets of locks and dams, creating pools or reservoirs. The reservoirs on the system tributaries capture rainfall and snow runoff in the wet winter and spring months and store it to support navigation in dry months. This system also prevents flood damages and avoids flood-related costs estimated to be $10-12 million annually. The ORT system supports 388 active intakes which withdraw 23.3 billion gallons of water per day for consumptive and non-consumptive use. Much of the water is used to cool steam electric generating plants and is cycled back to the river. This water is also used for drinking, firefighting and crop irrigation, and is a valuable reserve during droughts.

The ORT navigation pools aid in assimilation of treated sewage. The constant and predictable flow of water significantly lowers treatment costs. Without the navigation pools, existing sewage treatment plants would need to be re-licensed based on the least minimum flow at the plant site.

The dams create many recreational opportunities in the pools and in landside campgrounds and parks attailwaters of the tributary dams, with great fishing opportunities. The pools do generate

substantial regional and national wealth in the form river recreational and riverside and lakeside residential property. Lowering the navigation pools would have a significant negative impact on property values which decreases regional wealth, income and spending.

Importantly local employeesare the primary beneficiaries of the ORT system. They hold high paying jobs that otherwise might only be available in coastal cities. Economical river transportation makes it possible for thirty to forty million tons of raw materials each year to be handled over the region's docks andthose materials are manufactured into final products here, providing 45,000 direct jobs. With a total of 217,000 related jobs in western Pennsylvania generating more than $3 billion in taxes, the jobs created enough tax revenue to fund completion of the entire

Lower Monongahela Improvement Project in just half a year. When the Lower Monongahela Improvement project is complete, industry and the region will realize an additional $2.2 billion in labor, environmental and transportation benefits each year.

Why does it matter?

Unfortunately, adequate funds are not being allocated to improve the ORT's aging infrastructure. The locks and dams that provide these diverse benefits were designed for a 50-year lifespan. Currently, 14 of the 17 sets of locks and dams in the Port of Pittsburgh District are over 70 years old and incredibly someare over 100 years old.

The condition of the locks and dams is precarious. In September of 2009, one of the gates in the Markland Lock, located in Warsaw, KY failed while a vessel was in the chamber. A similar incident occurred again in February of 2010 at the Greenup Lock and Dam near Huntington, WV. Both incidents took months to repair and cost industry and consumers millions of dollars in alternative transportation costs. Many industries were close to shutting down.With inadequate maintenancefunding these unscheduled closures will continue to occur and could jeopardize the operations of the industries dependent upon this mode of transportation.

The infrastructure must be maintained to keep our inland waterways viable with year-round transportation. Commercial navigation is important to the region's economy because it is the most economical mode of transportation. Industries are not the only users of the river. Recreational boating, kayaking, and fishing are gaining popularity that many of us enjoy. Protecting this infrastructure needs to be everyone's priority.

About the authors...

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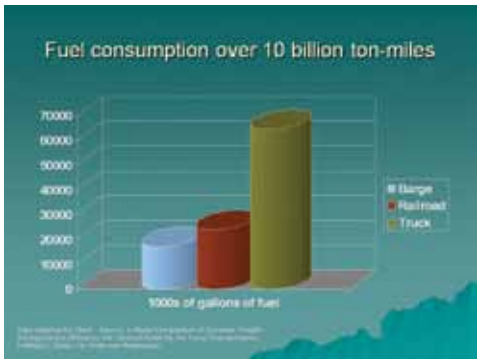
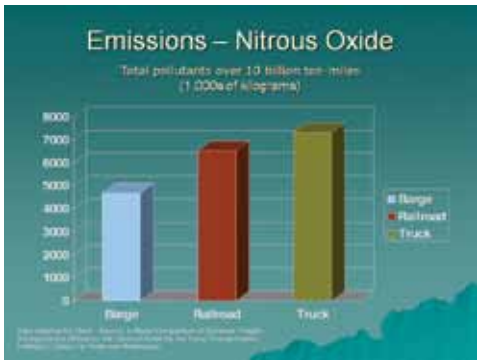
Inland waterway transportation is by far the most environmentally compatible mode of surface freight transportation. Compared to truck or rail, barge transportation has a much smaller impact on the environment with regard to not only air pollution due to emissions, but to other adverse societal impacts such as noise pollution, congestion, and safety.

Barge transportation has been shown to have the smallest carbon footprint, with significantly fewer emissions of carbon dioxide and other pollutions such as Nitrous Oxide, Carbon Monoxide, Hydrocarbons, and Particulate Matter. A recent study conducted by the Texas Transportation Institute's Center for Ports and Waterways (A Modal Comparison of Freight Transportation Effects on the General Public, 2007, amended 2009) found that when comparing transport emissions per ton-mile, rail emits 39% more CO2, and trucks emit 371% more CO2 than transport by barge. The importance of this difference comes to light after the EPA's 2009 estimate that "33% of our nation's annual carbon dioxide emissions come from transport-related activity."

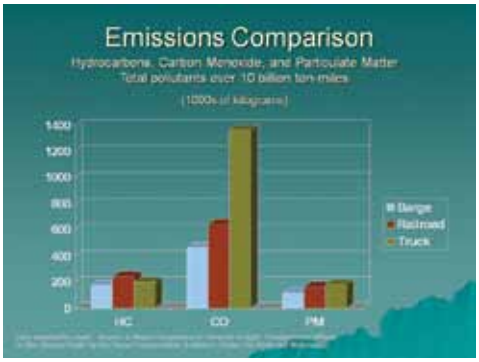


This environmental advantage is one result of greater fuel efficiencies that barge transportation offers. Barge transportation yields 576 ton-miles per gallon of fuel compared to 413 for rail and only 155 for truck transportation. This fuel efficiency is not only better in terms of emissions, but consumes fewer energy resources and lowers costs for industries. The efficiencies of scale with waterway transportation mean that a typical barge carries as much cargo as 16 rail cars or 7 trucks. A single towboat will typically move 15-barge tows. This translates to 216 rail cars (requiring 6 locomotives) or 1,150 large semi tractor-trailer trucks. Unlike trucks or trains, these barge tows often pass quietly by almost totally unnoticed by the local populace.



The Inland Waterway System reaches 38 states and is used to transport more than 60% of the nation's grain exports, 22% of domestic petroleum, and 20% of the coal used for generation of electricity. If, according to the TTI study, the 274.4 billion ton-miles of waterborne cargo were shifted to other modes, heavy truck traffic would double and/or rail freight movements would increase by 25%, resulting in the generation of an additional 2.1 million tons of carbon dioxide from railroads or 14.2 million tons from trucks. Further complicating matters is the fact that the other modes would not even have the necessary capacity to handle all of the additional cargo.

Safety is another area where barge transportation excels. While the rates of spills for barges and rail are about the same (just over 3.5 gallons per one million ton-miles), they are about half that of trucks. Injuries and fatalities are very low: for every 1 injury in barge transportation, rail incurs about 125 and truck more than 2,000. The ratio of fatalities for every one occurrence in barge transportation, there are 22.7 for rail and 155 for truck.



Earlier studies undertaken to compare the efficiencies and environmental effects of transportation modes, such as MARAD's Environmental Advantages of Inland Barge Transportation (1994); Minnesota DOT's Environmental Impacts of a Modal Shift (1992); and the USACE's Analysis of Environmental Aspects of Waterway Navigation (1980) have all shown the same conclusion: that waterway transportation is cleaner, cheaper, and more efficient. Even now a major undertaking is in progress to upgrade the nation's towboats with cleaner diesel engines which will even further improve the environmental benefits of transporting goods by barge. PE

About the authors...

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"So, What do People Do with the Cargo on the River?"

By Wayne Christy

Photo courtesy of Dan Jones, USACE

The Port of Pittsburgh is famous for moving a lot of "primary" products, but not the so-called "consumer goods" that people recognize more readily. For some, that makes it harder to relate to the need to modernize the rivers, because they don't connect themselves to the products. What the waterways do, however, is build the blocks for others to make the products those consumers do recognize.

It is an interesting story to watch how the waterways get us "from here to there" and what all that means for the local economy.

The Port of Pittsburgh handles 30 million to 40 million tons of cargo over its docks each year, worth about $3.5 billion, a significant stand-alone figure by itself. But it is not the value of the goods when they arrive that is so important, it is the value we add to them, before they go out, that demonstrates the real importance of the port. Here are some examples.

Western Pennsylvania still produces some of the highest quality steel in the world, a production that is both functionally and strategically dependent upon a healthy navigable waterways system. Without an efficient water transportation system our plants would not be competitive in today's international steel market. For instance, the facilities at US Steel produce roughly 7.5 million tons of steel per year and employ nearly 8,000 people. There are approximately an additional 45,000 direct related service and supplier jobs supported by this facility's activities. While US Steel is the largest steel producer in the region, they are not the only major metal employer in western Pennsylvania. Reliable waterway transportation is vital to the success of all of those metal makers, and to the many families that rely on their activities for their livelihood.

United States Steel's Clairton Coke Works, located along the Monongahela River, is the largest integrated steel maker in the nation. The Clairton Coke Works produces a high-quality blast furnace coke used by both U. S. Steel facilities and other steel producers. Clairton employs approximately 1,200 people in the coke-making process.

Furnace coke produced at Clairton is made from blends of various metallurgical coals, all of which arrive at Clairton via barge over the inland waterways system. Clairton receives approximately 6 million tons of metallurgical coal by barge annually,

more than 17,800 tons of coal each and every day of the year. The vast majority of this tonnage comes directly off terminals on the Ohio River. Due to efficiencies realized as a result of the waterways, U.S. Steel has been able to continue to make a significant capital investment to modernize parts of the plant.

Metallurgical coal is barged in from West Virginia to make 3.5 million tons of coke. The coke, combined with barged-in specialty ores and minerals from Russia, China, South Africa and from around the world, make metal plates, bars, shapes and coils, which are then sent out over our roads, railways and even rivers to feed the automotive, appliance and airplane manufacturing markets throughout the US, Canada and Mexico.

As one of our major metal manufacturers responded, when asked how many of these metal making jobs would be here without the waterways, he replied "none of them". The waterways are that important to the economy of western Pennsylvania.

As another example, consider steam coal, much of it mined here, that is barged to over 20 different power plants to heat homes and offices and to produce consumer products. Other coals, from as far as Montana, are barged to blend with our high BTU coal to meet clean air standards. Often one can see barge loads of coal passing each other in opposite directions on the river. It is not just coal that the power plants use however; they are barging in limestone to scrub or to clean the emissions before they are released into the air.

Marine contractors dredge sand and gravel and barge it to plants to combine with more rock and limestone to make concrete and cement for stadiums, skyscrapers and highways.

Petrochemicals in tank-barges from the Gulf of Mexico make the long barge voyage to the Port of Pittsburgh to supply fuel oil for homes, cars and jet airplanes; asphalt for our roads; and lube oil, alcohol, styrene, resins, industrial chemical, solvents and fertilizers. Chemical plants turn lube oil into white oil for pharmaceuticals and turn solvents into high tech chemical products. Styrenes and resins are processed into pellets and high impact plastics for later processing throughout western Pennsylvania into food containers, automotive dashboards, adhesives, coatings and ink for printing and bar coding, industrial grinders and even fine toothpaste.

The river traffic makes it possible for Western Pennsylvania to act as if it were on an ocean, producing energy and competing in world markets for chemicals, pharmaceuticals and metals. To borrow a (modified) line from a company's ad of a few years ago, it is not that you know us by a lot of the products that we ship, but we ship a lot of products that allows others to make products you know better. PE

About the authors...

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Finding Solutions:
Investing in Our Inland Waterways

By Peter Stephaich and Michael Toohey

Modern lock and dam infrastructure is critical to the nation's commerce and the movement of more than 600 million tons of freight commodities valued at more than $70 billion dollars annually. The inland waterways transport about 20% of the coal burned to generate electricity in utility plants, 22% of domestic petroleum products and 60% of the nation's grain for export.

But just like a lot of transportation related systems – highways, runways, railways and bridges – the waterways' lock and dam infrastructure is in critical need of recapitalization. They were built, for the most part, during the Great Depression of the 1930s, some even older. They are now showing their age, with crumbling concrete and failing electronic components.

Some of these locks, like those at Emsworth, Dashields and Montgomery (EDM) on the Upper Ohio in western Pennsylvania, are too small for today's larger tows. For example, the largest of the three sets of chambers at EDM are only 600 feet in length, while the rest of the Ohio River takes modern tows of 1,200 feet. In these cases, the tows must split in half and transit one section at a time, adding cost to the eventual product production.

Funding to modernize our locks and dams has been woefully slow, inefficient and even detrimental. Failure to fix them in a timely manner has led to escalating costs, otherwise unnecessary maintenance and structures increasingly at risk of catastrophic failure. Also, failure to modernize means that none of the investments expected from the projects are to be realized. For just one example, the Lower

Monongahela Improvement Project is already seven years behind schedule, costing shippers and their customers $220 million a year in fuel, labor, and shipping expenses. These benefits could be very real. Without a changed commitment to complete the funding for this project, it will be another 10 to 20 years before we will ever see those benefits accrue to the people and industries of western Pennsylvania. Over 10 to 20 years, that is an additional $2.2 billion to $4.4 billion. This squandering is especially disconcerting since the towing industry has invested so much of its own funds to get the project completed.

> ...the Lower Monongahela Improvement Project is already seven years behind schedule, costing shippers and their customers $220 million a year...

This same towing industry has been paying for half of the cost of the modernization through a 20-cents-a-gallon commercial marine diesel fuel tax. The need is so great, however, that they have come together and offered to pay even significantly more.

Approximately 50 experts from the U.S. Army Corps of Engineers and the navigation industry developed, over an 18-month period, a comprehensive consensus-based package of recommendations to address ways to fund the continued vitality of this system. Called, the Inland Waterways Capital Development Plan, it was unanimously adopted in April 2010 by the Congressionally-chartered Inland Waterways Users Board and presented to Congress. If adopted and included in a bill such as the Water Resources Development Act (WRDA), the Capital Development Plan will seek to better prioritize and address the needs of the U.S. inland waterways system and provide additional funding for greatly needed infrastructure improvements.

The plan prioritizes a national list of navigation projects based on criteria such as economic benefit and condition, and would allow for the efficient completion of 25 navigation projects in 20 years, rather than just six projects under the current broken business model. The plan seeks standardization and design centers of expertise. It creates jobs, allows for increased exports to market, and would result in better use of taxpayer dollars to optimize the full benefits of the waterways navigation system to the nation.

The towing industry, which remains the only user of this multipurpose infrastructure to pay to support it, has proposed increasing the tax on themselves by as much as 45%. More than 200 industry stakeholders including national, state, regional and local organizations, and companies including the United States Chamber of Commerce, the National Association of Manufacturers, the Transportation Research Board/Marine Board, American Land Conservancy, National Audubon Society, National Corn Growers Association, National Grain & Feed Association, Steel Manufacturers Association, National Mining Association, National Council of Farm Cooperatives, the Port of Pittsburgh Commission, and many others from diverse segments of our national economy—have lent their support to this Capital Development Plan.

Nationally, there are 24 priority navigation modernization projects that have been authorized by Congress, but these projects lack funding. With Congressional action, projects are ready to be built in Ohio, West Virginia, Illinois, Kentucky, Pennsylvania, Washington, Arkansas, Tennessee, Texas, Louisiana and Missouri.

> ...the Nation's waterways transportation infrastructure...were once – and still remain -- the foundations for our country's growth, is a solution for increasing our exports and putting American workers back on the job. ...

With nearly 20% unemployment rate in the construction industry nationwide and a desperate need to modernize our locks and dams, investment in our aging inland waterways transportation infrastructure could put to work Americans in family-wage jobs on these priority projects. These more efficient locks and dams would keep America competitive in the world marketplace by reducing the cost of US manufacturing, reducing imports, increasing exports and providing a natural boon to our balance of trade.

Indeed, investing in the Nation's waterways transportation infrastructure and the sectors and systems that were once – and still remain -- the foundations for our country's growth, is a solution for increasing our exports and putting American workers back on the job. It is now up to Congress to determine if they wish to support this plan and this solution to keep America competitive, strong, and moving. The industry stands ready to work with Congress on a bipartisan basis to find a solution and keep America moving. PE

About the authors...

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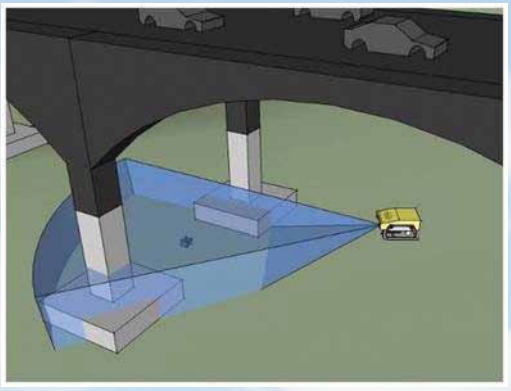
Life on the Waterways

By Sandie Egley

Throughout my career in Pittsburgh's engineering community, I have inevitably found myself involved with some aspect of the region's three rivers, the Allegheny, the Monongahela and the Ohio. In reflecting over my experiences throughout the years, I felt it would be beneficial to introduce just a few of the hard-working, skilled and dedicated professionals I've had the opportunity to come to know and work with directly. They are a part of the nearly 180,000 jobs that are directly or indirectly tied to the region's rivers. As you drive across any of the 446 bridges in and around Pittsburgh, they may be on the water just below you, providing all of us with the way of life we have come to rely on, day-in and day-out.

Gary Householder holding the imaging sonar device

One example of this is Gary Householder. Gary is a third generation employee of the US Army Corp of Engineers (USACE) and serves as the Operations Supervisor



The imaging sonar device assessing foundation conditions

Specialist Locks and Dams Branch of the Pittsburgh District. Gary has been with the USACE for over 34 years and one of his many responsibilities is to operate and maintain the USACE's Imaging Sonar equipment. This imaging sonar device (see photo below) is equipped to provide detailed imagery of underwater sites such as the locks and dams, bridge piers, and other underwater structures and objects. This imaging sonar device is fully capable in low visibility areas that are common conditions within the region's rivers, allowing for underwater operations regardless of water clarity levels. In addition to the sonar, Gary is the Underwater District Dive Coordinator and oversees 19 USACE divers in the Pittsburgh District, which maintain the 23 Locks and Dams and 16 reservoirs. Gary works with USACE Underwater Dive Coordinators and has helped to develop the USACE's program into the world-class organization that it is today.

Chad McDougall preparing for a dive at East Branch Dam

Next, let me introduce you to Chad McDougall. Chad was born and raised in Wyoming and when he graduated high school, he attended Divers Institute of Technology in Seattle, Washington. After school, Chad moved to Pittsburgh to be a dive supervisor with Marion Hill Associates Inc. I have worked with Chad for years and I can tell you that commercial diving is not the typical 9-5 job. Chad is on-call every single day and often gets that phone call in the middle of the night. There have been times in the middle of winter when Chad has had to break a hole in the ice in order to get into the freezing river to inspect a gate or to repair a river wall. Inland diving has taken Chad to many places you wouldn't think about when you think of commercial diving. In addition to diving in murky waters with low visibility, Chad has inspected many water tanks for local municipalities where they inspect the inside seams and they also vacuum out the bottom of the tank with a portable cleaner. On occasion, Chad will be called to untangle rope from the propellers from boats like those of the Gateway Clipper Fleet. Last year he was diving in the Hudson River planting 100,000 native plants in the riverbed. This summer you can find Chad and his crew of divers at the Emsworth Lock and Dam assisting with the placement of large grout bags to provide scour protection.

Did you know that in Fredricktown, on the Monongahela River

Fredricktown Ferry

there is a ferry that has taken people and cars across the river for over 200 years? The 35-ton ferry still makes about 200 trips a day and the boat is pulled along by underwater cables from Fredericktown to LaBelle, Fayette County and costs $2 a trip. The 64-foot steel ferry can carry up to six cars across the around 800-foot Monongahela River in about 3 minutes. The main Captain for the ferry is Larry Rutherford. Larry applied for this job right out of school and has been piloting the ferry for over twenty years. Larry has befriended many of his regular passengers and enjoys his job. The ferry that is being used today was constructed in 1948 is believed to be the last remaining such vessel east of the Mississippi River, and on most days they operate for two eight-hour shifts, Monday through Saturday.

Over the years, the primary use of Pittsburgh's three rivers have transformed from being primarily industrial to now attracting upscale development and providing recreational activities. This has resulted in a paradigm shift that has brought the rivers to be a focal point of the region. This renewed awareness and appreciation for the three rivers in Western Pennsylvania will help to ensure that our rivers can preserve their strategic importance as commercial waterways and support our vast recreational opportunities. This is further supported by the fact that in growing numbers, people are returning to the rivers to work, play, and live. For the first time since before the American Industrial Revolution, being close to the rivers is not something that people avoid — it is something Pittsburghers strive for!

About the author...

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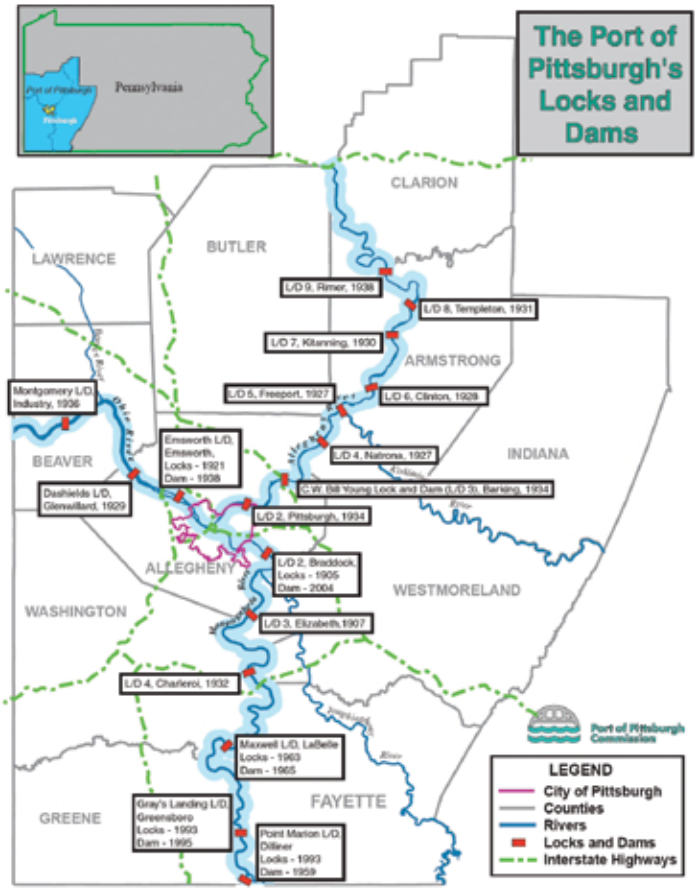
The Economic Value of the Port of Pittsburgh

By Mike Brinza

The rivers of Southwestern Pennsylvania serve a unique and vital role in the economic health of the region. The Port of Pittsburgh is located at the northeastern end of the inland waterway system and is geographically unique, comprising three distinct, connected rivers (Allegheny, Monongahela, and Ohio) that form an arterial network throughout the 11-county (7,643 sq. mi.) region which passes through or alongside eight of those counties.

The 200-mile expanse of commercially navigable waterway has enabled numerous industries to locate along the rivers in order to take direct advantage of inexpensive barge transportation. This makes the Port of Pittsburgh economically unusual in that much of its cargo is either produced or consumed within the port district itself, instead of simply being shunted through to another destination. There are more than 200 individual barge facilities throughout the port district which make the port an integral and organic part of the regional economy, not merely a single-point enterprise.



The Port of Pittsburgh handles much more than just coal. While coal does account for three-fourths of the cargo, the port handles a wide range of commodities that reflect the diversity of manufacturing and commerce. These commodities include sand and gravel, iron ore, scrap, non-ferrous ores, road salt, jet fuel, gasoline, kerosene, fuel oils, asphalt, solvents, fertilizers, cement, concrete, lime, glass, and iron and steel products. The different types of industries that rely on the waterways for transportation means that most of the inbound commodities are used within the port district. Inbound and locally mined coal is used for electrical power generation; locally mined coal is also shipped out to be blended with coal from other sources; metallurgical coal is used in the production of coke for steel-making; building and construction materials are produced locally using sand and gravel, lime, gypsum, and asphalt; jet fuel arrives by barge for use at the Pittsburgh International Airport; plastics manufacturing is supported by petrochemicals shipped by barge; specialty steel products manufacturing benefits by being able to bring in basic steel materials and ship finished products out all by barge; and finally, Southwestern Pennsylvania's aggressive winter weather can always dealt with in timely fashion due to plentiful road salt that can be procured less expensively by municipalities with restrictive financial resources.

The result of this concentrated diversity of industry in proximity to the rivers is that the range of employment supported by the Port of Pittsburgh consists not only of those directly involved in waterway transportation and its peripheral services, but also those employed by manufacturers, utilities, services, and merchants who rely on waterway transportation directly or indirectly. A study conducted by Martin Associates revealed that 217,877 jobs, approximately 17% of the total workforce, are supported by the port's activities. While the waterway transportation industry directly supports nearly 15,000 jobs, the shippers/consignees also support a further 30,000 direct manufacturing jobs. Purchases made by these firms in the local economy (totaling over $9 billion) supports almost 150,000 jobs, referred to as "indirect" jobs. Finally, re-spending by direct employees among local businesses supports another 23,000 "induced" jobs. Taxes generated include $2.2 billion federal and $1.0 billion state taxes. The region is home to 2.65 million people, all of whom are affected by the rivers in some way, whether as employees, consumers, participants in recreation and tourism, or as taxpayers (the movement of freight on the water takes much of the burden away from overland infrastructure).

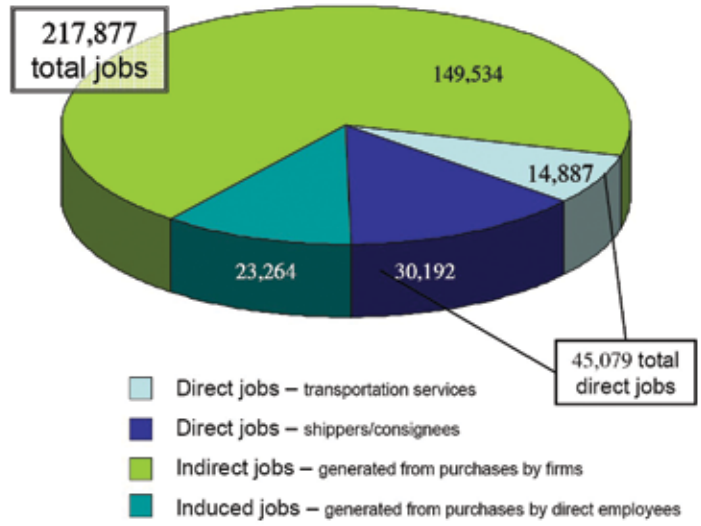
Consumer-based commerce is also supported by the waterways, with water-related recreation being an important component of the leisure life of residents in the region. Pleasure boating activities include fishing, motorboating, and rowing, kayaking, and canoeing. Commercial boating operations consist of excursions, guided tours, educational programs ("floating classrooms" where students learn through direct interaction with the rivers), and passenger services such as water taxis and shuttles. The rivers are also host to organized events such as the Three Rivers

Regatta, the Head of the Ohio, and professional bass fishing tournaments. As a direct outgrowth of the popularity of water recreation, marinas and waterfront restaurants are as plentiful as industrial river terminals.

Finally, an often-overlooked economic impact of the rivers is the availability of the water itself. Southwestern Pennsylvania's expansive watershed is a plentiful resource for community water, industrial water supplies for various manufacturing processes, and even firefighting water. However, the mere presence of the rivers is not enough to ensure consistent and reliable water supply to meet these needs. The stable pools created by the navigation dams guarantees adequate depth to keep water intakes submerged. In addition, flood control dams upstream on the main rivers and tributaries help smooth out seasonal changes.

The Port of Pittsburgh is an economic engine that doesn't simply impact Southwestern Pennsylvania, it defines it, and yet none of this is possible without a fully functioning and reliable system of navigational locks and dams. Continued investment in this important segment of our nation's infrastructure is critical to maintaining the economic vitality of Southwestern Pennsylvania. The adverse impacts of an inability to navigate these waterways would not only be detrimental to the port district, but would likely resonate far beyond the immediate area.

Jobs generated by river system activity in the Port of Pittsburgh



About the author . . .

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Spotlight on

ESWP Outreach Programs

Powering Symbiosis: Engineers Without Borders at Carnegie-Mellon University Hard at Work in India

By Joshua Jedlicka

When Carnegie-Mellon University (CMU) engineering students think of an unproductive day at school they may be talking about a challenging exam, a failed lab experiment, or maybe lack of sleep to meet the rigors of their degree programs. However, they have the security in knowing their education will not be distracted by lack of electricity, suffocating heat, noise or air pollution in classrooms. Imagine being six years old, learning to read and write, study the fundamentals of math and science, or even eat lunch in classrooms with temperatures over 100oF and without electricity. These conditions are a daily occurrence for students at Symbiosis Primary School in Rampur, India, where a team of CMU students are working to improve the conditions for learning through Engineers Without Borders (EWB).

Symbiosis primary school students meet with EWB volunteers

Four hundred K-6 grade students at Symbiosis must develop the building blocks of their education on occasional days without state-supplied electricity, and in classrooms affected by the searing heat of this region. When electricity is unavailable, the school runs aging diesel generators which produce loud noises and noxious diesel fumes. This is an unfortunate necessity in order to operate fans to cool down the rooms, or for any kind of learning involving computers at this school. The realities of Symbiosis are not uncommon in this urban region of India. Challenged by extreme poverty, schools cannot afford a better solution, but they are not without resources, ingenuity and hope.

The EWB-CMU team was introduced to Symbiosis through the efforts of Pittsburgh-based engineer Dr. Sam Shamsi. Sam grew up in the region and knew of the difficulties of learning in the conditions the Symbiosis students faced. While visiting family in 2010, he met with school officials and returned to Pittsburgh determined to work with EWB to find a solution to improve the learning environment. EWB-CMU team was eager to help, and is currently developing a design for renewable energy systems to power the school.

A team of six CMU students and Dr. Shamsi visited Rampur in March 2011. Joining in this global effort were two Indian-based engineers from nearby Delhi who are serving as in-country volunteers and are also technical experts in solar applications in India. Symbiosis official and students were excited and hospitable hosts, and the CMU team was able to gather data, exchange cross cultural lessons and communicate the needs and objectives well with this English-medium taught school. Community input and the long-term financial commitments were discussed with school administrators to understand the needs of the school and to ensure the CMU team is designing practical, sustainable solution.

Upon completion of the site assessment, the EWB-CMU team

has determined that installation of a solar photovoltaic energy supply is the best solution to provide Symbiosis with reliable, clean energy as desired by the school. Symbiosis' commitment to environmental stewardship within their curriculum has excited the EWB-CMU team and basic elements of solar energy will be taught to all students through lessons created by the EWB-CMU team. Excitement and hope is rampant according to EWB-CMU Student Project Manager Tejank Shah, a Sophomore double major in Materials Science and Biomedical Engineering: "We were just so overwhelmed by the generous hospitality we received during our stay in India. The school prepared a formal reception and showered us with thank-you cards and requests for autographs. It really was heart-warming to experience such an atmosphere."

With a firm community buy-in, CMU team is undergoing a parallel design effort with an Indian-based solar vendor to install a solar array by March 2012. Acting as designers, project managers, fundraisers and cultural ambassadors, the CMU team has developed a multitude of real-world skills to complement what they are learning in the classroom. "I believe engineers have a responsibility to design and implement solutions that not only address present issues, but take into account life-cycle sustainability and allow for future growth," says Eva Humphrey, a Junior Mechanical Engineer major and member of the first site assessment team. "Considerations for the future are especially important when working in the developing world because the growth rate is so high and precedents are not yet set."

An advantage of this project is the significant potential to work with the community to reproduce similar solar projects after Symbiosis is successfully installed, and empower community members to create new economic opportunities for themselves. Meeting the demands for clean energy in rapidly expanding urban areas is a critical global issue of the next century and the EWB-CMU team has this idea firmly in their vision. Dr. Shamsi adds "most EWB projects address needs of remote communities. Project Symbiosis is the first EWB project that will help the educational needs of an inner city community using renewable energy."

Excitement, passion, discipline, altruism – these are all words which describe the efforts of the EWB-CMU team involved in the Symbiosis project, but also for their determination to create a better world through engineering while developing their own career skills in engineering. Mr. Shah, who started his managerial role as an 18 year old freshman has noted, "as the student project manager, I've learned to effectively communicate with people of different backgrounds, oversee a variety of planning tasks, and create and adhere to a realistic project budget and time-table. I certainly will be able to carry these skills into my future engineering career."

The dream of seeing these children learn in improved conditions to become future leaders in renewable energy is what drives EWB-CMU as they take this project into construction. The efforts of EWB-CMU are fully voluntary for this non-profit organization. The students and mentors donate their time for design and oversee raising all funds required to provide travel for the team and supply materials for the implementation of the project. The team is constantly seeking new participants and also funding to ensure this project can be completed. If you have any interest in participating or donating to this effort, please contact EWB-CMU Student President Kyle Shatzer kshatzer@andrew.cmu.edu, and Symbiosis Project Manager Tejank Shah tejanks@andrew.cmu.edu. The Symbiosis travel experience is documented at: http://poweringsymbiosis.blogspot.com/, and more chapter information can be found at the EWB-CMU website http://www.contrib.andrew.cmu.edu/~ewbcmu/index.html PE

About the author...

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Wednesday, February 22, 2012

David L. Lawrence Convention Center, Pittsburgh, PA

Honoring 2012 William Metcalf Award Recipient Bernie Fedak

and featuring

Guest Speaker NASA Astronaut Catherine Coleman

The Engineers' Society of Western Pennsylvania (ESWP) Annual Banquet is the premier networking event for the technical community in this region. Our 128th banquet, scheduled for February 22, 2012 at Pittsburgh's David L. Lawrence Convention Center, is poised to uphold the highly valued networking, and advance ESWP's primary mission: engineering education. Please mark the date now on your calendar and plan to join us for a very special evening.

For the latest updates on the ESWP Annual Banquet including Engineer and project of the Year Nomination Forms, please visit our web site at: http://www.eswp.com/eswp/annual_banquet.htm

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