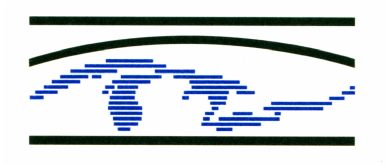

GREAT LAKES PROTECTION FUND

REPORT ON AN EXPERT MEETING:

NEW MODELS FOR ECOSYSTEM MANAGEMENT— BUSINESS MODEL INNOVATION FOR WATER "UTILITIES"

May 25, 2011
Evanston, Illinois

EXPERT MEETING:
NEW MODELS FOR ECOSYSTEM MANAGEMENT—
BUSINESS MODEL INNOVATION FOR WATER "UTILITIES"

SUMMARY REPORT

Background and Purpose

On May 25, 2011, the Great Lakes Protection Fund (GLPF or Fund) convened a workshop of water, wastewater, stormwater and drainage experts in Evanston, Illinois to explore new business models for the restoration and ongoing management of Great Lakes watersheds. A list of participating experts can be found in Attachment 1 to this report. The agenda for the meeting is Attachment 2.

Specifically, the GLPF asked the expert panel to discuss and advise as to what role, if any, it, the Fund, has in financing teams to explore "breakthrough" strategies that can lead, again, to new models for the next generation of "public utility," integrating water, wastewater, drainage and other functions, capable of delivering economic value, creating ecological quality and providing an expanded set of social goods to watershed residents.

The GLPF sought to identify specific examples of "doable," concrete projects and potential partners or team members across all sectors-utility, academic, business, finance and private equity, agriculture, forestry, landscape architecture, engineering, transportation, public works, etc.

The participating experts were provided with a Working Paper entitled, *Redefining Utilities, Infrastructure, Service, and Assets Workshop* with a view toward stimulating thought and discussion and offering several "for instances" of potential, innovative areas to discuss. A copy of the working paper is Attachment 3 to this report.

Former GLPF board member from Michigan, G. Tracy Mehan, III, Principal, The Cadmus Group, Inc., who also assisted with the drafting of the working paper and this report, facilitated the meeting.

The following synopsis is intended to capture the spirit of those discussions, not to be a complete transcript. Unless consensus is specifically noted, this document should not be read to imply endorsement of the contents by all of the individuals present. The Fund deeply appreciates the participation of these experts not only at the meeting, but also in preparation and post-meeting follow-up.

Discussion Highlights

Water services/utilities/ can be seen as a patchwork of isolated institutions responding to what are now understood to be symptoms of disrupted hydro-ecological systems. Drainage, drinking water, and sewage treatment services arose in response to specific historical, hydrological, fire protection, and public health circumstances. They remain in their present configuration by reason of tradition and the network of complementary institutions (regulatory agencies, consulting firms, financing and rating agencies, etc.) that have arisen in parallel with one another.

Basically, the water sector, broadly defined, has been too deeply wedded to a fragmented view of the world. There is a great need for integrated operations that moves the utility sector and related

municipal authorities from an exclusively engineered approach to something more like "engineered ecology." Indeed, different parts or stages of the hydrological cycle are regulated or funded by separate, distinct laws, regulatory regimes and regulations.

One participating expert conceptualizes the integrated model as including water, energy and natural capital in the context of a changing climate. He counsels the use of Integrated Resource Management (IRM) as an umbrella metric that enables integrated design and planning scenarios. He also refers to it as the "watershed planning scale to municipal development."

We may need some kind of "municipal ecologists."

The need for greater integration in the water and utility sectors is very much an issue of governance, defined to include managing, horizontally, relationships between the public, private and not-for-profit parties as well as vertical integration between federal, state and local governmental entities to achieve overall public health, watershed and ecological objectives.

One participant opined that "It's worse than you think," given that it is not just a question of managing the watershed but the people who dwell there while residing in differing jurisdictions or sectors of society. The complexity of the governance challenge is daunting given the need to address problems that extend beyond service areas of specific utilities or specific municipal boundaries. Yet, overcoming these challenges can also yield significant cost savings through more efficient delivery of services.

As one expert put it, "The sewer system guys and the watershed guys need to get together."

A broader conversation can also facilitate productive collaborations focused on climate variability, the water-energy nexus and adaptation.

The "finance gap" is likely a symptom of a dysfunctional business model, not a shortfall of funds. There does not appear to be any real barriers to accessing capital markets. Rather, the difficulty is raising rates to cover needed capital expenditures.

As in Detroit, Milwaukee's traditional structural, engineered approaches for CSOs are "hitting the wall," financially at least. New governance approaches such as the Southeast Wisconsin Watershed Trust, which bring together many partners to pursue land-based "green infrastructure" or best management practices, are important to pursue. To integrate stormwater, green infrastructure, agriculture, and beach closings with the CSO remediation necessitates talking about flow and pollutant sources throughout the entire watershed and sub-watersheds, not just wastewater exclusively.

The discussion turned toward issues of financial sustainability of utilities and watershed approaches, with the comment that private equity (public-private partnerships) might be a way to finance land-based treatment or controls on private property. State revolving loan monies cannot be spent on private property, only on public or municipal systems. This might be worth exploring relative to stormwater management.

Another expert offered the comment that utilities do not differentiate their services based on price or market segmentation. In other words, they do not charge for higher value services anywhere near their true value.

The challenge, noted one participant, is to shift from a taxpayer-based design for financing infrastructure to an IRM-based, revenue-generating design model.

More analysis, i.e., information, is needed to validate the effectiveness and economic benefits of green infrastructure in terms of cost savings and provision of multiple ecological benefits. There are really not many case studies out there right now.

This observation was seconded by another participant who called for more work at smaller scales to understand cause and effect as well as the costs and benefits of new innovative approaches such as low-impact development (LID) and green infrastructure.

The value of the "green template" is being documented in reports such as the Philadelphia Triple-Bottom Line study and the recent report on green infrastructure as a wet weather treatment option by the Center for Neighborhood Technology and American Rivers. These "open source" reports are expanding the necessary base of information. Are we heading toward a "green portfolio standard"?

How do we incorporate natural capital into municipal infrastructure balance sheets?

New investment and pricing models are needed, as are the skills to design, test and implement them. The water sector and communities generally need to move beyond a simple least-cost compliance model and begin to embrace the concept of natural capital in terms of revenue generation and more accurate valuation of ecosystem services. They need to move from simple waste management to zero waste. Such a closed loop, energy savings approach could generate billions of dollars if viewed on a life-cycle basis.

One participant summarized the discussion as attempting to deal with three (3) challenges: (1) how to go from centralized utility systems to decentralized ones, (2) how to get the price signals right, and (3) how to move to a closed loop water system ("off the grid") similar to what Seattle Public Utilities are doing.

The volumetric approach to water finance and pricing needs to be reconsidered given the need to protect flow regimes and declining water consumption and population in inner cities. Is de-coupling of rates and volume necessary? Is water treatment and provision a commodity or service or both? If the latter, how can this value be captured in prices and rate structures?

Municipal utility managers do not access abundant private capital or equity because they do not understand how to present specific, fundable projects, with enticing return on investment, to the equity markets.

In general there is a lack of needed information and transparency; and customers often do not understand the value of services being provided. Products and assets are undescribed, under-valued, under-managed, and under-deployed.

Another participant posited *the* fundamental problem as being education and the lack of understanding resulting from a compartmentalized educational system, up to and including engineering schools which fail to educate their students on basic ecological functions, cause and effect, etc. Thus, the general public and decision-makers are not able to grasp the need for a new paradigm of hydrological and ecological management. There is, in other words, "a profound disconnection from natural processes" or the understanding of same. Ours is a culture of the "free dump." We do not charge enough for water or wastewater services, lost revenue which could be used for environmental improvements or projects.

Other participants seconded the importance of educating the broader population, on a variety of water-related matters. That is the only way to ultimately change the paradigm. So information ("The right information for the right scale.") is basic to that process. There was a sense on the part of some participants that there is a need for educational campaigns for various subjects, targeted to multiple and various audiences.

Others noted that paradigms do not change as a result of education alone. Education provides learning, not necessarily action. Hence, traditional forms of public education may not provide the desired result of actual behavior changes. Understanding what the desired actionable end goals are for an education campaign and promoting what the benefits are for the target audience are critical for success. Engagement, experimentation and transparency are key elements for this type of initiative.

The central role of good data and information is exemplified in the case of Detroit's 25 percent loss of population, just in the last decade, and the crushing burden of traditional approaches (structural) to Combined Sewer Overflows (CSOs) regarding which it was able to gain some relief from state regulators. There the important information was economic and demographic.

Innovation is necessary and possible, but massive change will take time. The "water industry" will not be remade overnight. It will, however, need to adapt to major pressures including a likely decrease in external subsidy, increased expectations for delivering environmental results, deferred maintenance, and a new generation of management.

One expert observed, based on experience, that a bottom-up approach to experimentation, say, in creative financing, and on-the-ground technological innovation, combined with outreach and education, can overcome institutional inertia.

Another participant pointed to the need for "milestones" or smaller steps which move a utility and its broader community along the path toward water quality objectives without overwhelming everyone. The key is to focus on the overall goal, be it protecting a Great Lake or other body of water, and mobilize stakeholders around new approaches.

Experts identified a series of potential project opportunities. Expert participants utilized, in part, the working paper (Attachment 3) provided to them, and cited several illustrative ideas that served as a starting point for this conversation. They emphasized that the new utilities of the future would be different in at least three fundamental ways: first, the scope of their services and operations-the range and exact nature of the financial, societal and environmental products offered

or deployed; second, the scale of their operations, their physical and financial size; and, three, their institutional relationships with federal, state, provincial, local and private actors that will own, operate, finance, regulate and manage these new entities.

For example, addressing urban wet weather issues through land-based, i.e., "green" approaches, such as green roofs, rain gardens, or urban reforestation, might generate multiple benefits such as mitigation of urban heat islands, sequestration of carbon, provision of habitat, additional recreational opportunities, reduction in energy intensity and the least-cost means of attaining water quality objectives.

Not surprisingly, two participants raised the issue of Asset Management (AM) generally and in the context of green infrastructure as potential project area for the GLPF to explore. They thought the Fund might explore promoting this practice throughout the region to address two, if not all three, of sustainability's triple-bottom line.

Another expert pointed out the need for a new model to evaluate "pollution inputs to a utility's service area from within the watershed" but outside its service area. Could the GLPF help a pilot utility, a wastewater system, say, to stand up a new company to remove or control x amount of nutrients entering waters outside the service area which impact waters within? This could apply to unregulated nonpoint sources in rural areas and to suburban areas for imperfectly regulated sources of stormwater runoff. We need "solutions on the land," as another participant noted. The same idea could apply to source water protection for a drinking water utility, too. The resulting discussion touched upon several different areas the Fund might explore stemming from this idea.

First, existing literature on water quality trading, between point and nonpoint sources, has noted the positive role that intermediaries-brokers, bankers, and aggregators-could play in creating markets, reducing transaction costs, and overcoming asymmetric information which inhibit trading. The GLPF has had a long-standing interest in trading. This could be a more focused area to explore.

Second, another approach might be to investigate an "insurance approach" to the delivery of any number of utility or ecosystem services, both within and beyond the service area as needed. In other words, could the GLPF explore using insurance to spread the risk across customers and hedge against asymmetric information. As the water commentator, David Zetland, has stated, "…it's hard to know if spending is not too much and not too little [say, for maintenance, water quality or emergency preparedness], but just right." There is no sure connection between management and outcome.

"Instead of running a system with a low monthly charge and high probability of a break leading to expensive repairs and a jump in rates or a high monthly charge and low probability of a break leading to expensive repairs, managers could buy insurance against leaks and repairs."

The insurance approach could be coupled with the first approach outlined above.

Third, subsequent research reveals that the GLPF could also look into the concept of "social impact bonds." This new idea is being piloted in the United Kingdom. A governmental body or agency (why not a utility?) might issue bonds to private investors through an independent social finance entity. According to Jeffrey Liebman, Weiner Professor of Public Policy at Harvard's Kennedy School of Government, if predetermined goals are met, in a given time period, the government

agency makes performance-based payments that can be used to pay a return to the investors. "In theory, everyone goes home happy: The organization gets capital; the investor gets a return; society benefits from the service; the government avoids any potential risk and possibly saves money."[1]

The insurance approach or model and the concept of social impact bonds, at first glance, appear to mirror each other. Social impact bonds securitize expected performance payments in exchange for financing funded activity. An insurer, on the other hand, will provide a lump sum payment if the insured event occurs-in exchange for a certain revenue stream (policy payments).

A social impact bond model supports social activities with debt where those activities can be tied to a governmental revenue stream. The debt issuing body is private and contracts for specific services with a public entity. Payments to the private entity are contingent on hitting specific performance targets. Presumably, the spread between the interest rate on the bond and the schedule of payments exists because the private entity can deliver on the promised services more effectively and more efficiently than the governmental body.

It might also be worth exploring how social impact bonds, and other innovative financing models, could be developed within an IRM model or framework, relative to water, waste and energy, to reduce the overall burden on taxpayers.

The insurance model inverts the model. It is necessary to identify performance (output/outcome, level of service, revenue targets, etc.) and the "insurable event" (pipe breakage, system failure, water quality standard violations, revenue shortfall, even a CSO perhaps). The event either happens or not.

Both the insurance and the social performance bond strategies use markets to manage uncertainty, technically, by making uncertainties covered risks. The governmental entity may overpay, but that is the price for being a risk-averse, i.e., regulated, entity.

Another potential project identified for consideration by the GLPF is to explore the opportunity *to sell the value of saved water leakage based on the financial savings generated.* This could be done in the form of a public-private partnership (PPP) utilizing private equity. It would be necessary for water rates to rise or greater study and quantification of the savings potential (e.g., less treatment costs, deferred capital investments). The project could be a performance-based contractual model or something like the social impact bond or insurance approach described above.

Also, the Fund might explore ways *to involve or put into the hands of transportation and power utilities more responsibility for water quantity management* similar to the roles played by the federal Bureau of Land Management and the National Forest Service.

The GLPF might also study the idea of *establishing a for-profit company, based on rates linked to impermeable surface, for purposes of managing stormwater.*

[1] Jeffrey Liebman, "Private Capital, Public Good," Impact (www.hks.harvard.edu), Spring 2011, p. 1. See also Jeffrey B. Liebman, "Social Impact Bonds: A promising new financing model to accelerate social innovation and improve government performance," Center for American Progress (www.americanprogress.org), February 2011.

An ambitious suggestion was made for the GLPF to *evaluate, even pilot, a merger of all utilities in a community-water, wastewater, municipal waste, stormwater, energy and transportation-into an umbrella corporation to target asset management, the water-energy nexus, sustainability, etc.* "One water, one infrastructure." Dr. Penny Burns's work at the Adelaide University was cited regarding strategic asset management and infrastructure as a revenue-generator.

A related idea generated by the experts' discussions was *to nurture "Charter Watersheds," presumably in urban or suburban areas to experiment with many of the ideas generated by the workshop.* The objective would be "big, outsize returns"-ecological, financial and social.

There was some discussion regarding potential opportunities for exploring new models in the context of municipal or utility bankruptcies (e.g., Pontiac, MI). Such trying circumstances might result in greater receptivity to re-designing water/wastewater/stormwater systems and pursue new ways of thinking that could also encompass ecosystems and ecosystem services concepts.

Another question or issue noted, not an identifiable project, was the need to engage the investor community (e.g., retirement funds) in water investments and PPPs.

One participant recommended that the Fund pursue work on *reducing the costs of and optimizing green infrastructure including use of remote sensing, IT analysis of flows throughout the system (right time, right place).*

Conclusion

The meeting yielded the following over-arching observations regarding any effort to bring change to the institutions in the water, wastewater and drainage sector:

- There are big changes underway, and these institutions will need to evolve. The Fund's work could be about shaping the path that evolution follows.
- Interventions need to be specific, powerful and create the conditions for large-scale change.
- There are no "magic bullets." A series of related interventions, over time, will be required.
- Be patient, big change will take time, these institutions emerged over decades; and they will only change over decades.

These experts were very sensitive to the real-world constraints (e.g., politics, organizational culture and the ongoing recession) in their quest to identify creative yet feasible ideas for the GLPF to pursue in its aim to embed its mission within the next generation of Great Lakes water and wastewater utilities.

Still, there seems to be a vacuum waiting to be filled by some combination of public-private partnerships, private capital, new business models and synergy between environmental and economic considerations. The Fund can play a meaningful role in testing these approaches.

Attachment 1

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Attachment 2

AGENDA
New Models for Great Lakes Ecosystem Management

REDEFINING UTILITIES, INFRASTRUCTURE, SERVICE AND ASSETS WORKSHOP
Great Lakes Protection Fund
MAY 24-25, 2011
ORRINGTON HOTEL EVANSTON

May 24
6:30pm Dinner for workshop participants

May 25
8:00am Sign-in, coffee & self-introductions

8:30am Welcome-Russell Van Herik, Executive Director, Great Lakes Protection Fund (GLPF)

8:40am GLPF & Outcomes for Workshop-David Rankin, Vice President & Director of Programs

9:00am Challenges to & Opportunities for Sustainable Watershed Management in the Great Lakes

10:45am Break

11:00am Identification of Project Opportunities for GLPF

12:30pm Break for Lunch

12:45pm Working Lunch (Project Opportunities continued)

2:45pm Break

3:00pm Projects: Design, Ripeness, Scale, Cost, Teaming & Outreach

4:00pm Adjourn

Attachment 3

NEW MODELS FOR GREAT LAKES ECOSYSTEM MANAGEMENT
A WORKING PAPER
(*for discussion only, not for circulation)*

FOR
REDEFINING UTILITIES, INFRASTRUCTURE, SERVICE, AND ASSETS
WORKSHOP
MAY 25, 2011
HOTEL ORRINGTON
EVANSTON, IL

Introduction

Watersheds, and the ecological systems embedded within them, have proven difficult to effectively govern[2]. This is especially true in the North America's industrial heartland, given its very real economic challenges and the related constraints on the capacity of all levels of government. The Great Lakes Protection Fund aims to explore how a new generation of "public utility"—integrating water, wastewater, drainage and perhaps other functions—could successfully deliver economic value, create ecological quality, and provide an expanded set of social goods to watershed residents. The Fund wants to explore what new models can better restore environmental conditions, protect public health, and safeguard property. These new "utilities" would likely be different in at least three fundamental ways: The scope of their services and operations—the range and exact nature of the financial, societal and environmental products to be offered; the range of assets to be deployed. The scale of their operations: their physical and financial size. Their institutional relationships: the federal, state, provincial, local, and private actors that will own, operated, finance, regulate, and manage these new entities.
This vision of utility watershed or ecosystem leadership encompasses the watershed within and outside the traditional service area(s) in both its urban and rural aspects where possible.

Specifically, GLPF wants to explore what role, if any, it has in financing teams to explore "breakthrough" strategies that can lead to such new models. In particular, what is more efficient and effective approaches than are currently in common use today. For example, addressing urban wet weather issues through land-based, i.e., "green," approaches such as

[2] "Govern" is intended broadly here—meaning the act of multi-sector governance. The term "government" refers to the formal political institutions at the federal, state and local levels. Certainly, government must be governed; but it is not the only thing that partakes of governance. One scholar has noted, no longer is "governance" viewed as a synonym for government. "Rather governance signifies 'a change in the meaning of government, referring to a new process of governing; or a changed condition of ordered rule; or the new method by which society is governed." Gerry Storker, "Governance as theory: five propositions," (UNESCO 1998), p. 17.

green roofs, rain gardens, or urban reforestation, might generate multiple benefits, e.g., mitigate urban heat islands, sequester carbon, provide habitat, reduce energy intensity as well as protect water quality. Such approaches could, conceivably, save dollars by reducing capital costs. Moreover, they would provide aesthetic improvement, be more transparent to citizens and enhance their overall quality of life. Thus, the environmental, economic and social elements are all addressed simultaneously. This way of approaching watershed and utility management challenges not only avoid problems and rectify problems but also create value in terms of all three bottom lines.

New projects, also, should assist in overcoming the numerous polarities which characterize much of current water management and policy: land versus water, quantity versus quality, surface water versus groundwater, point sources versus nonpoint sources, urban versus suburban versus rural, water versus energy, and public versus private. They will challenge or at least broaden the concept of utility management to go beyond the very important but limited function of running a facility to include the entire drainage, catchment, basin or watershed and the people who reside therein. See the case studies appended to this working paper for more examples from around the United States and Canada.

GLPF hopes to identify specific examples of "doable," concrete projects and, again, potential partners or team members, across all sectors-utility, academic, business, finance and private equity, agriculture, forestry, landscape architecture, engineering, transportation, public works and as well government at all levels. These potential members would not only provide ongoing advice, counsel and project work, but would also be the basis for further outreach and education to and of the Great Lakes community generally.

Challenges

Each of you has a sound grasp of the many daunting challenges to watershed, ecosystem and utility management in the region and the nation as a whole.

The financial challenges facing state and local governments are self-evident. EPA and other organizations have documented the infrastructure investment gap facing the water, wastewater and stormwater utility sectors as well as the difficulty obtaining political support for increased rates and tariffs or more government loans or subsidies. Some local governments find themselves in financial receivership. Regulatory and public demands and expectations continue to accelerate.

In addition, the nature of the threats and deterioration in the physical, chemical and biological integrity of the waters of the U.S. and the Great Lakes can now be traced to many dispersed, unregulated or under-regulated sources such as agricultural runoff (nonpoint sources), habitat and stream alterations, stormwater runoff resulting from increased imperviousness and deforestation, air deposition and a myriad of land-based causes. Utility managers are "playing without the ball" and must rely on other players who control land use, development, transportation and economic decision-making.

Further progress in restoring and protecting the Great Lakes, its nearshore areas and its tributaries will require broader partnerships to implement watershed-based approaches. The GLPF is hopeful that workshop participants will identify and describe Great Lakes watershed/ecosystem needs, *presently unaddressed*, for which utilities (water, wastewater and stormwater) could provide valuable leadership in a collaborative, partnership mode on an ongoing basis including material support.

From the perspective of the GLPF, there are a plethora of challenges it would consider pursuing in further grant-making activities. These include overcoming barriers to full-cost or full-value pricing, utilization of private equity in infrastructure financing, integration across public and private sectors, green infrastructure (GI) including but not limited to low-impact development (LID), understanding and managing water and energy footprints, and overcoming non-monetary barriers to innovation and the adoption of new models and paradigms. The Fund is most interested in testing the smallest number of significant innovations that could unleash the potential of new "utility" business models.

Opportunities

As the GLPF explores opportunities to support the transformation of the utility sector in terms of sustainability's triple bottom line, it seeks to identify projects that show promise in terms of *design, ripeness, scalability, cost-effectiveness* as well as potential *teams and partners* to pursue them. Teams are also crucial to subsequent *outreach, education and dissemination* of findings, lessons learned and successful practices generated to the broader Great Lakes community of policy and practice.

The GLPF is looking for "breakthrough" strategies, that is to say transformational projects to actualize a triple-bottom-line approach by which utilities can pursue watershed and ecosystem objectives more efficiently and effectively. Ideally, such strategies or projects will make the vision of innovative utility-based watershed and ecosystem management a reality in the Great Lakes Basin and can be tested across urban and rural landscapes in the region.

The following illustrative project ideas that are on the path to a new generation of utility-based watershed/ecosystem management approaches. These include the following:

- A project could analyze the various ways water creates wealth in the basin, identify where the economic gains are greatest, what costs are assigned to the public, and explain why. Ideally, the project would test ways to replace high public costs with high public benefits. Such work would include ways to assess all impacts associated with water use, including consumption of electrical power and related emissions, the infrastructure development caused or avoided, and positive and negative natural resources impacts; and minimize the impacts while maximizing benefits.

- A project could test the effectiveness of green infrastructure or other management techniques using one or more of the measures created in past Fund-supported work, and/or other techniques. Such work would illustrate how the path that

water follows across or through the land determines the ecological health of streams, rivers, and lakes and evaluate how well different measures of hydrologic integrity perform in different places. Such work would create a new water use framework that includes drainage/runoff as a category of use.

- A project could pilot (even as a virtual exercise) a new public utility model that includes water productivity and resource improvement as specific objective. Such a utility could include drinking water supply, wastewater treatment, runoff management and other services at a watershed scale.

- A project could demonstrate how groups using shared groundwater resources can adapt to more users without impacting the health of conjoined surface waters. For example, a team could expand and test the groundwater impact assessment system developed in Michigan to other areas of the basin.

- A project team could create an integrated set of metrics to measure and manage the services a "next generation" utility should provide. These would include service levels for well head protection, drinking water supply security, watershed health, instream water quality, emissions footprint, distributed water storage, evapotranspiration levels, and so on. They would be arrayed in a science-based system of measurement, management and pricing.

- A project team could design and test, even in a virtual setting, value-based pricing for certain water services. This might include water supply for large industrial customers, drainage treatments for upper watersheds, and other things a "utility" might provide that is more valuable than the average or marginal cost of service. Such experiments might include exploring all-in, second price auctions for water service-especially in areas where groundwater sources are overtaxed. The team would explore how such techniques might work and what set of changes in policy, practice, structure and governance might be needed to use them.

- A project team could test elements of the information technology infrastructure needed to support decentralized solutions to watershed management. They could install, network and analyze data from a ubiquitous set of sensors measuring stream flows, ground moisture, rain barrel levels, and so on to paint a real time picture of watershed conditions; they could test remotely operated sumps, pumps, sprinklers and drains (say on rain barrels) to increase water storage in advance of a storm; and they could explore financing and operating models to make a networked solution operable.

- A project team could design, model, capitalize and promote insurance or financial warranty products for utilities moving toward greater economies of scale and/or scope. This would include creating—a compelling, measurable and broader set of performance attributes; a financial model that estimates the costs of failing to hit those targets and the likelihood of failure given present governance, financing and operating regimes; and underwriting criteria for the products. A team could couple this with a "prediction market" to improve the underlying analytics.

- A project team could design and test an asset management system specifically to include evaluation of GI or LID approaches at every stage of the process as another alternative to be explored other than traditional grey or hard infrastructure. See the "thought experiment" below.

Again, these examples are illustrative, not prescriptive, for purposes of the workshop discussion. Nevertheless, they provide a sense of the interest of the GLPF in these issues.

The GLPF is very interested in market approaches (e.g., pricing, trading, information); integration within the governmental sector and between it and the private sector; "smart" watersheds, i.e., where there is sufficient data and monitoring to inform effective management; metrics which drive new business models relative to water management, again, in both the private as well as the public sector; and governance inclusive of political and non-political, i.e., civil society, bodies and institutions.

A thought experiment: asset management and the integration of green and grey infrastructure

One potential opportunity, which combines elements of integration, information and sustainability, is expanding the notion of asset management as practiced in the United Kingdom, Australia and New Zealand and spreading rapidly in the United States. It also provides an opportunity to address urban wet weather issues in a systematic, least-cost and environmentally optimal manner.

There are different ways to characterize asset management (hereinafter "AM"). For instance, Veolia Water describes it as making the right decisions at the right times about the AM schedule and its life or replacement.[3] It entails three primary steps: 1) the definition of a level of service, 2) deciding upon the least costly way of delivering that service level, and 3) determining how to manage the level of risk at an acceptable level. Of course, there are other basic steps to be taken such as an inventory of existing assets

[3] "So What the Heck Is Asset Management? And Why Should Cities and Towns Care?," WAVE (Veolia Water North America), Fall 2007, p.2-7.

and a "criticality" analysis to understand what needs to be addressed immediately and what assets can be "run to failure" if necessary.

Seattle Public Utilities has used AM for years to reduce O&M budgets by ten percent and its 6-year capital improvement program by roughly $150 million. Utility rates were reduced, cash reserves increased and reliance on debt was reduced-all while maintaining service levels.[4]

Gresham, Oregon, near Portland, has had an AM program for its wastewater collection system for years. It completed its condition assessment and integrated it into a geographic information system (GIS). It experienced zero overflows (as of 2007), and only 15 percent of its repair work was done on an emergency basis. Thus, it concluded that the program was working very well for its collection system valued at $100 million.

Besides assuring effective delivery of chosen levels of service to customers, AM enables far more rational deployment of limited, scarce resources both monetary and human. So this is a direct benefit to at least one of sustainability's bottom lines. However, there is an opportunity to address another bottom line, the environmental one, by factoring in the role of GI, LID and even rural watershed protection, the "green" assets which should be protected, enhanced or restored in such a way as to provide the preferred level of service at the least cost. This will also generate multiple environmental benefits such as aesthetic value, habitat, mitigation of urban islands, carbon sequestration and restoration of natural flow regimes to name a few.

Thus, AM presents an interesting opportunity to be considered by the GLPF for exploration as economically beneficial program, but also as an enhancement of the environmental quality of both urban and rural watersheds.

To formulate AM in other terms, one might consider expanding the role of GI, LID and watershed restoration in light of the following questions relative to utility management[5]:

1. What is the current state of my assets?
2. What is my required level of service?
3. Which assets are critical to sustained performance?
4. What are my best O&M and CIP investment strategies?
5. What is my best long-term funding strategy?

Meshing the green and the grey infrastructure through the mechanism of AM would be consistent with the recent thinking on utility and watershed management.

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[4] E-mail from Steve Allbee, EPA's resident expert on AM, to G. Tracy Mehan, III, The Cadmus Group, Inc., April 27, 2006, citing Elizabeth S. Kelly, P.E., Director, Corporate Asset Management, Seattle Public Utilities Commission.

[5] Washington Suburban Sanitary Commission, "The Practical Application of Asset Management," PowerPoint presentation, April 7, 2011, p. 4.

A 2009 report from the Aspen Institute on its dialogue on sustainable infrastructure[6] sets out three principles as the basis for its many recommendations for redefining the nation's concept of infrastructure and putting it on the "Sustainable Path." First, "the traditional definition of water infrastructure must evolve to embrace a broader, more holistic definition of sustainable water infrastructure that includes both traditional man-made water and wastewater infrastructure *and* natural watershed systems." Second, this principle "should be embraced by all public and private entities involved in water management, and these same entities have a shared role in ensuring their decisions consider and integrate a set of criteria that include environmental, economic and social considerations (the Sustainable Path)." The third principle explicitly states "that a watershed-based management approach is required for drinking water, wastewater and stormwater services to ensure integrated, sustainable management of water resources."

The Aspen report states that water and wastewater utilities "can lead the way by developing policies and practices that promote preservation and restoration of water resources by fostering strategic partnerships to collaboratively use integrated water resources planning and management as a tool to examine assumptions concerning supply, demand and alternative methods of meeting unmet future demand and social, economic and environmental challenges."

There is a fast-growing body of literature[7] on the economic, environmental and social benefits of GI and LID which creates an opportunity to integrate them with AM techniques to optimize the triple-bottom-line approach and assure the optimal mix of green and grey infrastructure in the utility portfolio. It is not an either/or proposition but one of assessing the relative benefits to the triple bottom line.

Conclusion

GLPF is grateful for the time, expertise and experience which workshop attendees are willing to offer relative to a new vision of the utility in the Great Lakes basin. The foregoing discussion hopefully gives you some idea of what it is seeking by way of input. Your charge is wide-ranging but will hopefully yield concrete, achievable projects which will transform utility management for the benefit of the Great Lakes ecosystem, its economy and its citizens.

That said, the GLPF suggests that workshop participants face squarely the most important threshold question of all: *Is there a value-added role for the GLPF in this field or area of practice?* Hopefully, there is. But if not, participants should feel free to speak their mind.

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[6] R. Bolger, D. Monsma, & R. Nelson, *Sustainable Water Systems: Step One-Redefining the Nation's Infrastructure Challenge. A report of the Aspen Institute's Dialogue on Sustainable Water Infrastructure in the U.S., May 2009, pp. 6-7, accessible at http://www.aspeninstitute.org.* See G. Tracy Mehan, III, "Redefining Water Infrastructure for the 21st Century," Roll Call, July 20, 2009, www.rollcall.com.

[7] For instance, see Center for Neighborhood Technology and American Rivers, *The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental and Social Benefits* (CNT 2010) available at http://www.cnt.org/repository/gi-values-guide.pdf.

Another fundamental question is whether or not a pilot project approach is really the right one to transform the role of utilities in watershed and ecosystem management in the region. That is the way the GLPF normally does business, but maybe this subject area requires some other kinds of support or mode of enquiry.

In conclusion, the GLPF encourages participants to consider several more questions:

- What are the key issues that might affect whether and how we invest in this topic?
- Is there a set of ideas ready for deployment and testing? Is this still an academic discussion? If so, what kind of research projects set the stage for future action? What must be supported to allow field trials to begin? When can demonstration projects begin?
- Is there a "generic" search image for a project team? What is the ideal composition of a project team that can test the utility of such a framework? Who must be included? Whose participation is not necessary?
- To whom should the GLPF be talking? Who is doing the best work on these issues?
- What is the most useful scale to try this work? The watershed? The community? The service area?
- If there is good work to be done, what is the best way to solicit ideas? An RFP? Workshops? Some form of competition such as conducted by the City of Houston on GI and LID?
- What resources can we provide to prospective team members and applicants to enable creative proposals?

The GLPF thanks the workshop participants for their generosity in participating in this process.

APPENDIX A
CASE STUDIES & MODELS OF INNOVATION

Fortunately, there are emerging new models or approaches to meeting sustainability's triple bottom line at varying scales relative to communities, service areas and watersheds. Here are a few examples to consider. They are not meant to be exhaustive, only illustrative of new developments in the field.

The New York City Case

While not a purely collaborative undertaking, at least from the standpoint of many "Upstate" citizens, New York City's filtration avoidance program, pursuant to the Safe Drinking Water Act,[8] illustrates the possibilities of the watershed approach in the service of a utility's mission. Driven by new regulatory requirements in the 1990s, New York pursued an alternative to spending $6 to $8 billion on a new filtration plant to protect the 1.5 billion tons of drinking water it supplies to nine million New Yorkers daily. 90 percent of the water comes from the Catskill-Delaware watershed, 125 miles north and west of the city.

EPA gave its blessing to New York City to pursue a watershed management approach at a cost of only $1.5 billion. It effectively made the city responsible for restoring stream corridors, reforestation, buying land, paying for manure management techniques and fencing animals out of waterways, and other land- or watershed-based BMPs.[9]

Instead of only managing its hard or grey facilities, New York was now is responsible for managing its immense watershed as well.

The Milwaukee Case

The Milwaukee Metropolitan Sewerage District (MMSD)[10] had to respond to "urban wet weather issues," especially Combined Sewer Overflows (CSOs), releases of massive amounts of wastewater during big-storm events resulting from an infrastructure design in which sewage and stormwater are conveyed in the same pipes to treatment plants. When the pipes overflow, and to avoid disrupting biological treatment processes in the treatment plants, the wastewater is allowed to overflow into receiving waters.[11]
As a result of evolving federal policy, law and regulation, MMSD invested $3 billion in "grey" infrastructure through the 1990s as part of its Water Pollution Abatement Program

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[8] For information see http://www.epa.gov/region2/water/nycshed/filtad.htm.

[9] This discussion of New York City is drawn from James Salzman, *Creating Markets for Ecosystem Services,* New York Law Review 870 (2005), quoted at length in Robert V. Percival, Christopher H. Schroeder, Alan S. Miller and James P. Leape, *Environmental Regulation: Law, Science, and Policy, Sixth Edition* (Aspen 2009), p. 36.

[10] See http://v3.mmsd.com for more information on MMSD.

[11] U.S. Environmental Protection Agency, *Report to Congress: Impacts and Control of CSOs and SSOs,* EPA 833-R-04-001, August 2004, available at www.epa.gov/npdes.

(WPAP), for structural work, i.e., large underground deep tunnels to hold overflows for treatment after the storm event subsided. It is currently finishing another $1 billion investment.

Before WPAP came on line, MMSD experienced between 50 and 60 overflows per year with an annual average volume of 8 billion to 9 billion gallons of overflow. Presently, it has only two overflows per year with an annual average of one billion gallons of overflow.

Unfortunately, within the six (6) sub-watersheds in MMSD's service, all tributary to Lake Michigan, 37 percent of the annual bacteria load comes from rural nonpoint sources and 56 percent from urban stormwater.[12] Beach closings still occur after significant storm events. These challenges now eclipse CSOs as the main obstacle to further gains in water quality

In addition, University of Wisconsin researchers are predicting that extreme precipitation events will become 10 to 40 percent "stronger" in southern Wisconsin due to climate change and variability. CSO events, with resultant overflows into Lake Michigan, will rise by 50 to 120 percent by the end of this century.[13]

MMSD decided to pursue a collaborative approach to watershed management, focusing on flow reduction coming from stormwater and nonpoint sources which are either insufficiently regulated or not regulated at all. It is also developing watershed restoration plans for its six (6) sub-watersheds. Ultimately, it hopes to incorporate at least some of these areas into a watershed-based permit to control all point and nonpoint sources across numerous municipal jurisdictions.[14]

MMSD is promoting watershed-based, distributed "green" infrastructure approaches such as disconnection of downspouts, use of rain barrels, vegetated swales, cisterns, installation of green roofs and urban reforestation to supplement grey infrastructure and reduce flow through infiltration, retention and evapotranspiration at the site level.

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[12] Timothy Bate, William Krill, Troy Diebert, Leslie Shoemaker and Kevin Kratt, "Milwaukee's Next Step: Watershed Restoration Plans (*Instead of TMDLs),* Figure 1, a paper delivered to WEFTEC, Chicago, IL, October 2008, in the author's files. The authors included members of MMSD staff and outside consultants.

[13] Jonathan A. Platz, MD, MPH, Stephen J. Vavrus, PhD, Christopher K. Uejio, MA, Sandra L. McLellan, PhD, *Climate Change and Waterborne Disease Risk in the Great Lakes Region of the U.S.,* American Journal of Preventive Medicine, November 2008, p. 451; "Great Lakes' Study Ups Chances for Waterborne Disease," Water & Wastewater News, October 10, 2008.

[14] Watershed-based permits are (1) issued on a watershed basis, (2) focused on multiple pollutant sources, (3) targeted to achieve watershed goals, and (4) integrate permit development among monitoring, water quality standards, nonpoint sources and other programs. Patrick Bradley/LimnoTech, "NPDES Watershed Based Permitting," Powerpoint to the Southeast Wisconsin Watershed Trust, July 13, 2009. Bradley was the leading EPA expert on this subject before joining LimnoTech in 2008.

Subject to design, scaling and management, MMSD has documented capital cost savings from pursuing this approach.

It is already working with the Conservation Fund, one of the largest land conservancies in the nation, to buy and restore floodplains to manage flooding and reduce stormwater flows. This "Greenseams" program has acquired over 2,000 acres since 2002 and identified a total of 15,000 acres for purchase. MMSD has spent $13.4 million from its capital improvements budget and has also received some grants for the program.

MMSD came to realize that suburban communities, business, agriculture, environmental groups, universities and a range of stakeholders will have to be brought into the watershed process if the goal of transforming the landscape, in both its urban and rural aspects, is to be attained. This will be accomplished by means of "green" infrastructure for stormwater control and best management practices (BMPs) for agricultural nonpoint sources. It eventually came upon Chicago Wilderness[15]as a prototype of the kind of collaborative model MMSD needed to engage the larger community, including numerous local jurisdictions with a particular interest in stormwater compliance.

Chicago Wilderness is an alliance of organizations interested in protecting and restoring biodiversity in urban, suburban and rural areas in and around the Chicago metropolitan region. With its more than 240 members it is an effective public-private partnership. In time, something like a consensus was realized on a new entity akin to Chicago Wilderness: the Southeast Wisconsin Watershed Trust (SWWT),[16] popularly known as the "Sweet Water Trust." Formed in 2008, it sought to focus on "integrated water resources management" across political boundaries and engage in "second level planning" to fulfill the regional plan previously developed and in conjunction with the individual "Watershed Restoration Plans" to be undertaken in each sub-watershed. To that end, it has established "Watershed Action Teams" under the direction of an expanded Executive Steering Council.

SWWT aims to "Forge and strengthen relationships to leverage funding and recommend policies to assist in the implementation of projects to produce lasting water resource benefits and cost savings throughout the Greater Milwaukee Watersheds and nearshore Lake Michigan."

Among its primary purposes is "To build partnerships and enhance collaborative decision-making and joint project implementation engaging government, business, the building industry, agriculture, environmental, and other stakeholder organizations to obtain broad agreement and recommend where to invest funds to get the greatest benefit." SWWT's membership includes individuals, units of government, nongovernmental organizations and the business community. It is hiring staff and has received a $1.9

[15] http://www.chicagowilderness.org.
[16] http://www.swwtwater.org

million grant from the Joyce Foundation.[17] It also convenes a well-attended annual conference.

The Dockside Green Case

At the smaller, site level, in the city of Victoria, British Columbia, Dockside Green, a 15-acre mixed-use development, north of the harbor, is taking an entirely new approach to managing wastewater.[18]

Resident homeowners welcome a different kind of sewage treatment plant in their backyards with their ground-floor condominium decks jutting out over a network of ponds and waterways containing native plants, otters and ducks, reports Linda Baker of The New York Times. An artificial creek circulates wastewater from an adjacent underground sewage treatment plant, and water from it is also used to flush toilets and irrigate landscape-a closed system that reduces water bills for residents, provides wildlife habitat and improves the marketability of the properties. The project encompasses 26 buildings and 2,500 residents.

The development also includes an 8 million Canadian dollar heating plant that converts locally sourced wood waste into a clean-burning gas which handles all the development's heat and hot water. Fossil fuel use is eliminated as a heat source. It utilizes rooftop wind turbines and awnings that double as solar panels. A passive solar design, fresh air ventilation and efficient appliances help reduce energy use in the buildings by roughly 50 percent compared to conventional buildings. Individual units have sensors that allow residents to monitor daily energy and water use.

Dockside Green is, to use an Americanism, a Brownfields redevelopment in the heart of Victoria's industrial area which is undergoing some gentrification. The entire project is likely to cost 500 million Canadian dollars when finished.

The circumstances of all of the foregoing cases are unique in many respects. Yet, they typify fresh thinking regarding sustainable management of water, land and energy which is both environmentally protective, cost-effective and a boon to the quality of life in their respective communities and watersheds. Again, they illustrate aspects of innovation and collaboration.

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[17] "Sweet Water Trust and Its Environmental Partners Get Boost to Improve Water Quality in the Milwaukee River Basin," Press Release, July 7, 2009, Southeast Wisconsin Watershed Trust. In a complementary move, Joyce is also providing the national environmental organization, American Rivers a $375,000 grant, with a $150,000 match from MMSD, to work with Milwaukee communities to adopt sustainable "green" infrastructure solutions to wet weather problems. "Milwaukee's communities and clean water benefit from grant awarded to American Rivers," Press Release, May 1, 2009, http://www.americanrivers.org.

[18] This case is drawn from Linda Baker, "A Housing Project in Victoria That Embraces Nature," The New York Times, July 6, 2010, p. B7 (New York edition), available at http://www.nytimes.com/2010/07/07/realestate/commercial/07victoria.html