



**The New York Water Environment Association, Inc.**

*The Water Quality Management Professionals*

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14 April 2003

Assemblyman Thomas P. DiNapoli  
New York State Assembly  
State Capitol  
837 Legislative Office Building  
Albany, NY 12248

RE: Water Reuse Bill # A04081 (Formerly 11028-A)

Dear Assemblyman DiNapoli:

Please find attached a Position Paper from the New York Water Environment Association, Inc., regarding the Water Reuse Bill #A04081.

Bill A04081 was introduced in the State of New York Assembly by the Committee on Rules. The bill proposes at the time of SPDES Renewal, that the applicant study the feasibility of using reclaimed wastewater in a variety of applications. The purpose of this bill is to promote the reuse of reclaimed wastewater to protect a valuable resource.

Review Comments

This bill will require that nearly 8,400 (both surface and groundwater discharges) SPDES permit holders will need to conduct a study to address the potential of water reuse. This bill will not specify a minimum flow or population of the SPDES holder for this requirement to take effect. In addition, it does not identify specific reuse potential (i.e., irrigation, groundwater recharge or surface water enhancement) nor set necessary levels of treatment for specific reuse potential. This bill does not provide financial support to SPDES holders to study or implement reuse projects. In California, via the Water Recycle Act of 1991, reuse laws were supported by technical standards and financial support. In 1991, a goal of 1 million acre-feet per year was targeted for reuse in the State of California. By utilizing financial support,

485,000 acre-feet of water has been reused in California as of 1995.

Conclusion

Based on the NYWEA Water Reuse Task Force's review, this bill will require further coordination with the New York Water Environment Association to assist the New State Assembly in developing the details for a proactive approach to water reuse issues.

NYWEA supports this bill in concept but recommends certain modifications to reduce the number of SPDES permit holders that would have to conduct a study by the time of their first permit renewal after the effective date of the bill section. In addition, the 18-month period set for the DEC and the DOH to develop and promulgate rules and regulations is insufficient and should be extended in accordance with the departments' available resources.

Many thanks for the opportunity to comment on this important issue.

Sincerely,

A handwritten signature in black ink, reading "J. Kirk Rowland". The signature is written in a cursive style with a large, stylized initial "J" and "R".

J. Kirk Rowland  
NYWEA President



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Position Paper  
on  
Water Reuse

Water Reuse Task Force  
April 2003

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# NYWEA REUSE TASK FORCE

## Position Paper on Water Reuse

### 1. Purpose and Scope

In February 2002, a Task Force on water reuse was formed by the Immediate Past President of the New York Water Environment Association (NYWEA), David N. Ellis, to develop a position that would guide the NYWEA on water reuse matters. The purpose of this action was to take a proactive approach in guiding the development of laws, regulations and policy in NY State. As water reuse projects become more commonplace, particularly in drought-prone areas of the U.S. and the rest of the world, there appears to be an increasing interest in water reclamation as a means of coping with increasing demand on a finite water supply in our state. The Task Force consisted of Robert Adamski, Nicholas J. Bartilucci, Susan Boutros, David N. Ellis, Warren Lavery, John Mirando, Nabeel Mishalani, William Stasiuk, Mike Tamblin and was chaired by Guy Apicella.

The Water Reuse Task Force has looked at the national perspective in identifying the issues and obstacles confronting water environment professionals. One objective is to review water reuse efforts in other parts of the country by noting the successes and failures so that we may benefit from the past and focus future efforts in areas that have a high probability for success. In the course of this review, up-to-date and useful information and references are compiled to provide NYWEA members with technical support on water reuse. NYWEA members are directed to the available resources listed in this document as a means of developing and implementing water reuse projects. Opportunities for water reuse in NY State that are being developed or implemented are also summarized to provide examples of precedents that have been set in certain locales.

As the task force by definition is temporary, the long-term responsibility or custody for water reuse issues within either an existing NYWEA committee or a new committee is recommended. The broad nature of water reuse pertains to several candidate committees that are considered for the long-term responsibility:

- Environmental Science
- Government Affairs
- Public Outreach
- Watersheds
- Sustainability

The task force also realizes that the Board of Directors may find additional effort is needed to provide a smooth transition for water reuse to be assumed by a committee, and supported by the rest of the organization. Therefore, the task force members are committed to working with the committees for a period of time to make the transition effective.

## **2. Definition and Types of Water Reuse**

Wastewater reclamation involves the treatment or processing of wastewater to make it reusable, and wastewater reuse or water reuse is the beneficial use of treated water. Reclamation and reuse of water frequently require water conveyance facilities for delivering the reclaimed water and may require intermittent storage of the reclaimed water prior to reuse (Asano 1998).

### **Source Water Type**

- Municipal Wastewater
- Industrial Wastewater
- Storm Water

### **Reuse Application**

- Urban
  - Landscape irrigation
  - Vehicle Washing
  - In building uses (toilet flushing, air conditioning)
- Agricultural
  - Food Crops
  - Nurseries
- Industrial
  - Cooling
  - Boiler Feed
  - Treatment Plant service water
- Recreational
  - Golf Course Irrigation
  - Body-contact (lakes, ponds)
  - Non-contact (fishing, boating)
- Groundwater Recharge
- Environmental Enhancement
  - Enhance wetlands
  - Sustain Stream flows
- Potable Supply
  - Blending with municipal water supply
  - Direct pipe connection

### **3. Issues and Obstacles**

#### **3.1 Regulatory Process: Standards for Reuse**

The State of New York has very few projects that reuse treated wastewater. In New York there are four Public Owned Treatment Works (POTWs) with effluent that is used to irrigate golf courses (of course this is mostly during the summer season). Accordingly, New York State Department of Environmental Conservation and Department of Health have not developed extensive guidance or regulations specifically for the reuse of wastewater. Each proposed project to reuse wastewater is considered by DEC and DOH on an individual basis. There is not a set formula to handle wastewater reuse at this time.

With the limited experience of wastewater reuse in New York State, the following types of conditions have been placed on the individual State Pollutant Discharge Elimination System permits. As the reuse involves spraying on golf courses, where human contact would eventually occur, NYSDEC has required the sprayed effluent to have a measurable chlorine residual and to meet the nitrogen effluent standard of 20 mg/l. If new projects are proposed to reuse wastewater in other ways, such as cooling water, NYSDEC would have to develop any additional conditions that would be appropriate.

Water reuse is hindered by the lack of standards as POTW owners and their engineers incur potential liability for personal injury that may allegedly be due to water reuse. For example, a golfer after playing on a course that was irrigated with treated wastewater effluent contracts a water borne disease. Development of standards may encourage POTW owners to implement water reclamation and reuse projects in New York State.

#### **3.2 Public Acceptance**

“Finding solutions to the wide assortment of technical and scientific issues and problems associated with designing and building wastewater treatment and water reuse systems can be challenging and even fun for environmental engineers and utility managers. However, rarely do you hear utility professionals say solving “people” issues is fun. Nonetheless, the people side of water reuse decisions can be equally, and often more, challenging than solving the technical or scientific issues. The Water Environment Federation report *Using Reclaimed Water to Augment Potable Water Resources* (1998), which is the source of the previous statement, describes how public acceptance, or more specifically the lack of public acceptance, has affected potable water reuse projects.

### **3.2.1 Public Perception**

Water is a limited resource in a rapidly expanding global population. Many water resource professionals believe that reclaiming water after it is treated in a modern wastewater treatment plant is an important and underutilized element of sustainable water resource management. Water reuse for non-potable (e.g., irrigation, industrial) or indirect potable (e.g., discharge into drinking water reservoirs or supply) purposes has been considered across the country, but particularly in drier or drought-ridden communities, such as Arizona, California, Colorado, and Texas, or communities experiencing rapid population and economic growth that place a strain on water supplies, e.g., Georgia and Florida. It is only a matter of time before many other communities consider non-potable and potable water reuse options.

There is good news in the public's attitudes toward water reuse for the water professional. In spite of serious opposition in some California cases, the public has expressed an interest in being meaningfully involved in water reuse decision-making, and finding ways to ensure an independent and secure water supply for their communities (Bruvold 1981 and 1991; Lawrence 2000). The public is, in a very general sense, aware that there are water supply problems in many parts of the country and a few believe that some form of potable reuse is inevitable, given growth and water supply constraints (Lawrence 2000; Broad 1996).

Table 3.1 summarizes the challenges and opportunities faced by water reuse professionals, as detailed in these studies.

**Table 3.1. Challenges and Opportunities Faced by Water Reuse Professionals**

<b>Challenges</b>	<b>Opportunities</b>
<ul style="list-style-type: none"> <li>▪ Decline in public trust and confidence in public agencies and officials.</li> <li>▪ Decline in belief that best technologies can remove all impurities and germs from wastewater.</li> <li>▪ While the public tends to trust university-based scientists and the medical community on technical and health issues, they trust their own impressions of water quality more.</li> <li>▪ Public impression of water quality can often be based upon the water's turbidity or aesthetic qualities.</li> <li>▪ While education and outreach activities can increase support, they can also intensify the extremes – those that oppose become more strongly opposed and those supportive are more strongly supportive.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Public interest in being meaningfully involved in water reuse decisions.</li> <li>▪ Public interest in finding ways to ensure independent and secure water supplies for their community.</li> <li>▪ While the public is not well versed in the water cycle, they are generally aware that there are water supply problems in many parts of the country.</li> <li>▪ Belief that some form of potable reuse is inevitable, given growth and water supply constraints.</li> <li>▪ Information sharing, educational activities and opportunities for reflection upon the concepts of water reuse can increase support.</li> </ul>

(Broad 1996, Bruvold 1981 and 1991, Lawrence 2000, Jeffery 2001, Putnam 1995, and The Pew Research Center for People and the Press 2001 cited in WERF In-Press)

The intensity of the public's reaction, concern, and debate over water reuse is magnified when the reuse issues change from non-potable to potable. In fact, while the scientific and engineering communities for the most part believe that non-potable reuse is feasible and often desirable, the acceptance within the scientific and technical communities is far less uniform in regards to indirect potable reuse. The technical and scientific challenges and difference of opinion among scientists and engineers introduces greater uncertainty into the public debate. The uncertainty can be accompanied by more intensity in the opposition and expression of public concerns. As a result, the public discussion may be more contentious, and the application of the principles even more important to promote a constructive public dialogue.”(WERF In-press)

### **3.3 Legal Issues and Liability**

Currently, there are no specific statutes under which water “reuse” is regulated. However, certain reuse projects would be subject to state and federal statutes (and implementing regulations) because of the nature of the project. For example, an aquifer storage and recharge project (ASR) utilizing treated wastewater would be subject to federal regulation under the Underground Control provisions of the Safe Drinking Water Act (40 CFR 144-148). That project would also require a SPDES discharge permit (6NYCRR 750-758) pursuant to the federal Clean Water Act and a Water Supply Permit (6NYCRR 601) pursuant to the Environmental Conservation Law. While there are no specific provisions in those regulations that address reused water, the project would be subject to permit conditions developed specifically for that project. NYSDEC, under SPDES authority will require demonstration of compliance with groundwater standards. DEC will also require endorsement by NYSDOH of the project before it issues a Water Supply Permit. It is not clear what standards USEPA would apply. Another example would be a project using treated wastewater to block saltwater intrusion into an aquifer used as a source of drinking water. Both the Underground Injection Control part of the SDWA (UIC) and SPDES regulations would likely apply to the project. Although a Water Supply Permit would not be involved, it is likely that NYSDEC would consult with NYSDOH in the review and conditioning of this project. NYSDOH has not spelled out in regulation or guidance what specific issues would be considered. Because there are no guidelines or standards, agency review may be arbitrary and result in unreasonable conditions. The Association may wish to initiate a dialogue under which it would have input to guidance and/or regulations addressing water reuse.

### **3.4 Risk Management**

Risk management is one part of an iterative process linking risk management with the assessment of risk, the definition of health targets, and the evaluation of health outcomes. (Bactram et al. 2001) The United States surface water treatment rule, as an example, established a target that less than one person in 10,000 per year becomes infected from exposure to the protozoan *Giardia* in drinking water. This target was also assumed to be protective against other diseases at the time. The estimation of risk requires an understanding of a number of factors including the route of exposure, and the infectious dose. Waterborne diseases are classified by their route of exposure and typical exposures include ingestion and inhalation. The infectious dose (ID), usually defined as the ID50 or the dose required to produce illness in 50% of the population, maybe as low as a single organism and as high as hundreds of thousands. A great deal of uncertainty is present in making estimates of environmental exposures, and experts will often disagree. The measurement of the success of management is often subjective since the measures of human health in relationship to exposure are also imperfect. Estimation of risk is not an exact science.

In spite of the uncertainties a number of states have dealt sensibly with the issue of risk management of reuse water. Florida and California regulations focus on protozoa and viruses (York and Walker-Coleman 2000) and require limited monitoring for both categories of pathogens. The California regulations define general categories of use and then describe specific levels of treatment for specific categories of use. While experts might disagree on the details the general approach is logical and scientifically defensible.

An area of special concern deals with reuse water used in an application that creates a mist. Studies of wastewater treatment operators who have an occupational exposure to aerosols generally fail to show any increased rates of illness from viruses and other pathogens that could be associated with those exposures. Such studies have documented higher levels of antibodies in workers than in the general population suggesting that pathogens and viruses are present but the levels fail to produce illness.

### 3.5 Economic and Financial Factors

#### 3.5.1 Cost/Benefits

The cost of reclaimed water varies greatly from region to region. However, the purpose of reclaimed water is not necessarily to be cost comparative to a potable water source, such as groundwater or surface water. Reclaimed water projects are implemented out of necessity, where limited potable water is available to serve a population. The following is a list of projects with their associated capital costs:

<u>Location</u>	<u>Cost/MGD</u>
Rockland County Sewer District No. 1	\$17.75 <sup>(1)</sup>
Virginia Water Control Board	\$9.40
Metropolitan Water District of South California	\$4.40

<sup>(1)</sup> New facility with advanced architecture and difficult site conditions.

As shown above, these costs will not compete with water source projects where the cost of finding and developing a new source of water is not escalated due to limited availability. However, these costs are reasonable when supply of potable water is limited. The benefit of these projects is that the communities have a long-term supply of high quality water. These communities can then continue to meet the planning needs of their population.

#### 3.5.2 Regional Perspectives

The mid-Atlantic/northeast United States are regions in the county that have historically been water-rich. However, with the region experiencing a significant drought from 1998 to 2002 and some localized increases in population, historical

perspectives are changing. Currently, the region is embracing projects that reclaimed water for several users. The most common uses include:

- Landscaping
- Agriculture
- Industrial
- Groundwater Recharge

The oldest reuse project in the region is located in Virginia and was built in the 1970s. The Virginia Water Control Board replaced 11 small wastewater treatment plants with one highly sophisticated regional reclamation facility. The plant is currently designed for 54 mgd and accounts for 10-15 percent of the region's reservoir volume. However, during extended droughts, the flow has accounted for 90 percent of the reservoir inflow. The region's most recently proposed reclamation project includes the Rockland County Sewer District No. 1 Western Ramapo Wastewater Treatment Plant. This plant will discharge effluent to the Ramapo River. The plant will have a capacity of 5.0 mgd and will recharge the sole-source aquifer that serves both New York (Rockland County) and New Jersey.

At least three golf courses in New York State are reusing treated wastewater. Lake Placid, Oneida City and the village of Canton golf courses are irrigated using recycling wastewater with varying degrees of treatment and disinfection. Cedar Creek (Nassau County) was a demonstration project which is no longer in operation. During this project, the public had significant input in the level of protection that the plant would provide. The public supported the project due to the lack of water supply to serve the area's needs. During the recent drought (when this position paper was written), the area has seen very stringent restrictions on water use. Therefore, as seen in the southwest United States, water reclamation is being embraced in the Mid-Atlantic and Northeast United States as water becomes more valuable.

### **3.5.3 Financial Factors**

Perhaps the biggest marketing effort will be those efforts aimed at gaining public acceptance of reclaimed water for reuse. In many instances, public water is so under-priced that it would be difficult to find takers to pay higher cost and use a product perceived to be of lesser quality.

Where the price of reused water cannot compete with the availability and price of domestic water, then federal, state or local government incentives might be required to make the reuse product competitive. This loss of revenue to domestic water suppliers could cause the per unit price of potable water to rise. The increased unit cost for domestic water would be necessary to cover the carrying cost of infrastructure already in place. While the use of some water supply infrastructure would be diminished, the capital carrying cost would continue.

Reclaimed water pricing should consider the cost for the portion of a wastewater treatment plant dedicated to its treatment, any additional treatment required for its

final use, storage cost, pumpage and delivery systems. Other considerations that may affect the pricing include the reduction in a POTW discharge to the receiving water in cases where the discharger is at, or exceeding, its SPDES limits. The end use should be metered and paid by the end user, who would be the direct beneficiary of any governmental incentives available to use reclaimed water.

Treatment methods could include one or more combinations of the existing and available treatments:

- Sand and Multimedia Filtration
- Activated Carbon Adsorption
- Coagulation-Flocculation-Separation
- Softening
- Ultrafiltration
- Nanofiltration
- Reverse Osmosis
- Ion Removal
- Disinfection (chlorination, UV, etc.)

## **4. Resources for Water Reuse**

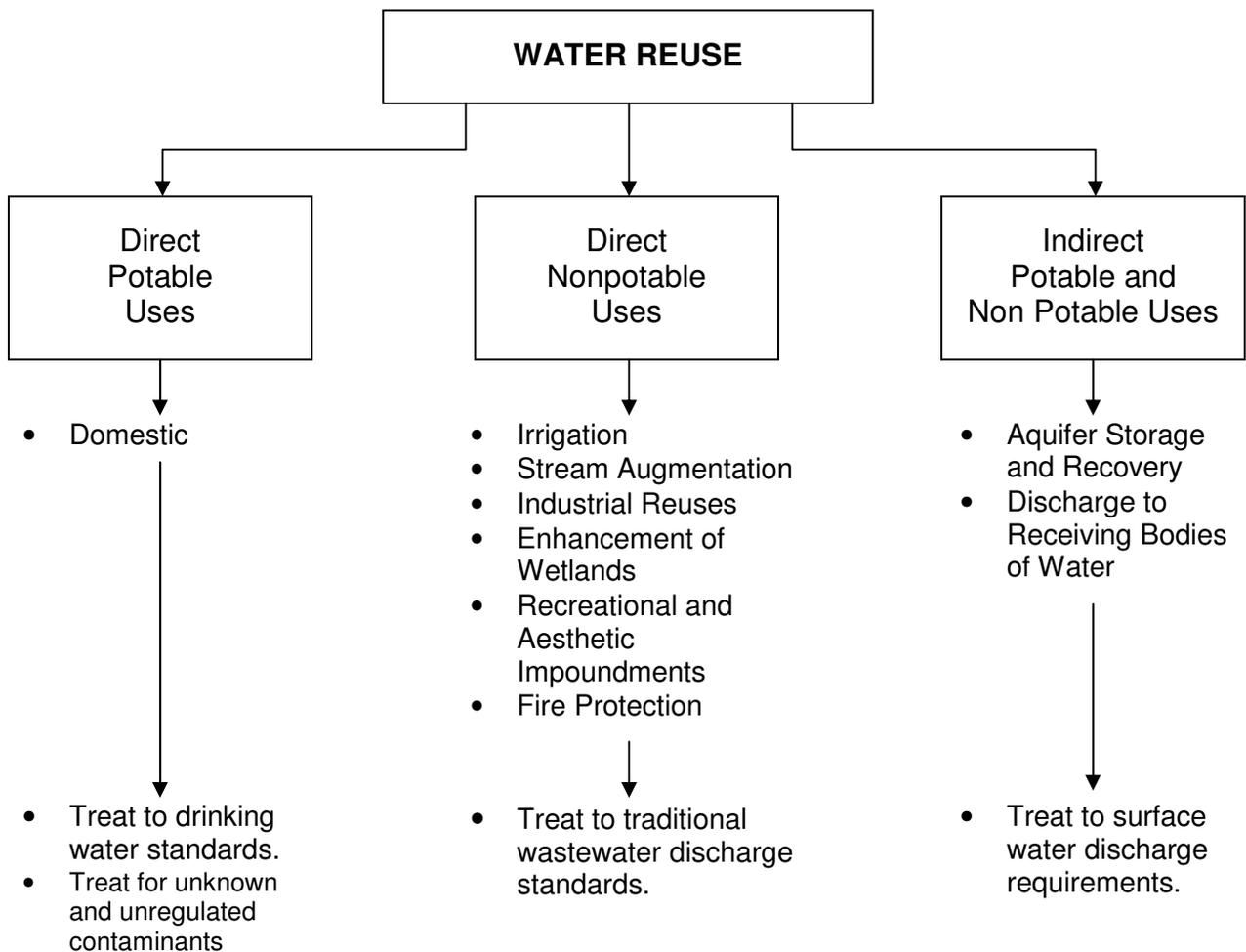
Documents and sources of information that were useful to the water Reuse Task Force are compiled and provided in this chapter. A primer proposed by USEPA Region 9: Water program is Water Recycling and Reuse: The Environmental Benefits, which is available online at <http://www.epa.gov/region9/water/recycling/index.html>. Another website is <http://www.wateruse.org>

### **4.1 Science**

A prime reference is Wastewater Reclamation and Reuse edited by Takashi Asamo (1998, 1528 pages). This book is comprehensive in addressing the full scope of scientific principles that range from microbial considerations to economic analysis.

## 4.2 Treatment Technology

The level and type of treatment technology required for water reuse will be determined by the type of intended use. Required treatment technologies will vary based on which of the following uses apply:



Water reuse regulations in California Stipulated the type of treatment for specific types of water reuse. The website for this is <http://www.watereuse.org/Pages/information.html>

### 4.3 Public Outreach

WERF has sponsored research projects and workshops to better understand the drivers of public perception and develop tools and processes for establishing and maintaining successful public outreach and input programs.

One of these projects, which is near completion and will be available in 2003. [Framework for Public Perception and Participation in Water Reuse Initiatives \(00-PUM-1\)](#) “establishes a framework of guiding principles from which new processes and tools can be developed, demonstrated, and improved. Through a literature review, case study analysis, and symposium of water professionals and social scientists, the project team developed the following five guiding principles of the Public Perception and Participation Framework.

***Principle 1, Information and Context.*** "Good science" has long been the guiding principle of decision-making. On the basis of the costly projects that failed because of the lack of public support, the principle of good science must now be expanded to include local knowledge and site-specific characteristics, community values and interests, and local contextual issues such as political, social, and economic factors.

***Principle 2, Communication and Dialogue.*** The effectiveness of communication mechanisms and the quality of the overall dialogue with the public contributes not only to successful information exchange, but also to the relationship factors that drive public perception.

***Principle 3, Trust and Trust-Building.*** Trust and perception have a cyclical relationship. Perception and behavior are influenced by trust, whereas the level of trust is affected by perceptions. People can trust or have confidence in many different types of entities and ideas, including technologies, science, or the people managing the technologies and systems.

***Principle 4, Fairness.*** The perception of fairness is very important in determining how the public views and responds to an issue. Fairness applies to both the decision-making process as well as the outcome. Everyone affected by the decision should be involved in making the decision.

***Principle 5, Motivation and Commitment.*** Multiple motives are usually required to engage all necessary participants in the decision-making process. The organizations involved must show a genuine, sustained commitment to public outreach that contributes to trust building and the perception of fairness. ”

#### **4.4 Legal**

The WERF report, Management practices for Nonpotable Water Reuse (2001), contains a chapter 5.0 Regulatory requirements, Permits and levels of treatment. Federal and various states' water reuse regulations and permitting practices are summarized in this chapter. California administrative Code title 22, Division 4 Environmental Health wastewater Reclamation criteria (1978) are reproduced in Asano 1998.

### **5. Recommendations for NYWEA's Position on Water Reuse**

#### **5.1 Conditional support for State Legislation**

Bill A04081 was introduced in the State of New York Assembly by Committee on Rules, and a similar bill was introduced in the State Senate. These bills propose that at the time of SPDES renewal the applicant study the feasibility of using reclaimed wastewater. The purpose of these bills is to promote the reuse of reclaimed wastewater to protect a valuable resource. The Water Reuse Task Force prepared these comments on the Assembly bill.

The bill will require that nearly 8,400 (both surface and groundwater discharges) SPDES permit holders to conduct a study to address the potential of water reuse. The bill does not specify a minimum flow or population of the SPDES holder for this requirement to take effect. In addition, it does not identify specific reuse potential (i.e., irrigation, groundwater recharge or surface water enhancement) nor set necessary levels of treatment for specific reuse potential. The bill does not provide financial support to SPDES holders to study or implement reuse projects. In California, via Water Recycle Act of 1991, reuse laws were supported by technical standards and financial support. In 1991, a goal of 1 million acre-feet per year was targeted for reuse in the State of California. By utilizing financial support, 485,000 acre-feet of water is reused in California as of 1995.

Based on the NYWEA Water Reuse Task Force's review, this bill will require further coordination with the New York State Water Environment Association to assist the New State Assembly in developing the details for a proactive approach of water reuse.

NYWEA supports this bill in concept but recommends certain modifications to reduce the number of SPDES permit holders that would have to conduct a study by the time of their first permit renewal after the effective date of the bill section. In addition, the 18-month period set for the DEC and the DOH to develop and promulgate rules and regulations is insufficient and should be extended in accordance with the departments' available resources. These modifications will streamline the effort to comply with new regulations and produce cost-effective results.

## **5.2 Coordination with American Water Works Association (AWWA)**

On August 30, 1996, AWWA approved a Government Affairs White Paper on Water Reuse. (White Paper should be included as an appendix to this section.) Additionally, AWWA revised a Policy Statement on January 22, 1995, regarding “Reclaimed Water for Public Water Supply Purposes,” which states the following:

“First and foremost, the American Water Works Association (AWWA) believes that sources of water with best available quality should be used for potable purposes. The use of reclaimed water can significantly reduce the demands placed on limited conventional supplies of potable water. Accordingly, AWWA encourages responsible use of reclaimed water in lieu of potable water for non-potable uses. Furthermore, when raw water supply sources to an area are limited and reclaimed water is generally of equal or superior quality to other raw water supplies, AWWA does not oppose indirect use of reclaimed water, whereby reclaimed water is a supplement to existing raw water sources receiving appropriate subsequent treatment. These sources must be acceptable to health authorities and water users.

AWWA urges continued research to improve treatment technology, monitoring techniques, and the development of health-based drinking water standards, thereby assuring the safe use of reclaimed water.”

As this is a NYWEA Position Paper, coordination should be with the New York Section AWWA (NYAWWA). NYAWWA’s input should be sought on locations within the State where direct non-potable uses could help lower uses of potable water; on drinking water standards; and on concerns for non-regulated contaminants. Several of the NYWEA Water Reuse Task Force members are also members of the New York Section of AWWA.

The topic of water reuse could provide a joint session of NYWEA/NYAWWA at either or both organizations technical sessions. It is recommended that this Position Paper be shared with the Board of NYAWWA, requesting their review and input. After this review period, NYWEA and NYAWWA should develop an agenda of research topics related to water reuse and petition their respective national organization’s research group to explore those topics.

## **5.3 Assist NYSDEC and NYSDOH in Developing Standards for Water Reuse**

As stated in sections 3.1 and 3.3, water reuse is hampered by the lack of regulatory standards. The WRTF recommends that standards be developed and that NYWEA assist the State by proposing these standards. Task Force members will work with DEC and DOH by responding to their comments in finalizing these standards. This effort

would draw on current national studies by EPA and WERF that are compiling information on the regulatory processes that states have adopted and the resulting management processes being implemented.

#### **5.4 Guidance on NYWEA's organizational approach**

We recommend that the water reuse be assigned to the Environmental Science Committee until there is enough interest for a separate committee. We recommend that the Public Education, Watershed and Government Affairs Committees have liaisons to Environmental Science to keep up on and bring information to the Environmental Science Committee

## **REFERENCES:**

Asanao, Takashi, Wastewater Reclamation and Reuse . Volume 10 Water Quality Management Library Technomic Publishing Co., Lancaster, PA. 1998

California Health Laws Related to Recycled Water Title 22 Chapter 3 Water Recycling Criteria. Article 3 Uses of Recycled Water. June 2001 Ed.

Jamie Bactram Lorna Fewtrell and Thor-Axel Stenstrom, Harmonized assessment of risk and risk management for water-related infectious disease: an overview , Water Quality: Guidelines, Standards and Health, World Health Organization 2001.

Water Environment Research Foundation, Framework for Public Perception and Participation in Non-potable and Potable Water Reuse Initiatives: Guidance on Establishing and Maintaining Public Confidence , WERF project 00-PUM-1, July 2002 DRAFT

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