New England Water Works Association Report
on the Effectiveness of the
Massachusetts DEP Water Management Act Permitting Policy
Approved by the NEWWA Board of Directors December 20, 2006

Executive Summary

The New England Water Works Association (NEWWA) has been asked to comment on the effectiveness of the Massachusetts Department of Environmental Protection's (MassDEP) *Guidance Document for Water Management Act Permitting* Policy, effective date January 17, 2006. This Policy applies to Permit and Permit Amendment Applications and 5-Year Reviews. The Policy has received extensive criticism from communities and water suppliers throughout the Commonwealth, directed in part at MassDEP's lack of meaningful public involvement in its development. Another concern that has been repeatedly expressed is the use of the *Stressed Basin Report,* which was issued by the Massachusetts Water Resources Commission in 2001, to categorize permittees in terms of the standards they must meet.

NEWWA is fully supportive of protecting and managing water resources, including streamflow. However, one of the major objections has been that the requirements of the Policy will not be effective in achieving the stated goal of *mitigating and restoring streamflow* and may harm efforts for *continued and sustainable economic growth throughout the Commonwealth*, another stated goal of the Water Management Act (WMA).

The underlying issue is that streamflow is affected by a diverse and complex set of site specific issues, yet the Policy and indeed other efforts are limited to water supply permittees, as if no other factors existed. Many water suppliers are concerned that since the new standards are unlikely to improve streamflow in any substantial way, more and more stringent standards will follow despite difficult implementation for many public water supplies. Further, the high cost of meeting the standards will consume limited funds that could be used more effectively to protect public health and the Commonwealth's water resources.

This report proposes an approach that the NEWWA feels would be more readily implemented, as well as more effective. This approach would involve a more holistic look at the various factors that contribute to maintaining our water resources, and more consideration of local conditions. Recommendations of this report include: uncoupling streamflow from WMA permits; use of realistic benchmarks that are linked to the particulars of each system; use of internationally accepted standards to report water losses; allowances for redundant wells in order to help minimize pumping impacts; reliance on hydrological balances (ideally evaluated on a watershed basis) to evaluate projected results; the development of a toolbox that would allow water suppliers to choose from a variety of techniques to promote the best management of local water resources; and the establishment of a balanced group of stakeholders to finalize the WMA policy and toolbox.

NEWWA's Involvement
The NEWWA represents 3,000 water works professionals including system managers, consultants, regulators, contractors, manufacturers and academics mainly in the 6-state New England region. The association is concerned that this Policy, which is inconsistent with today's approach to Best Management Practices for Water Loss Control, will have limited effectiveness in comparison to a more comprehensive and flexible approach. In that the Policy to date has focused on only one small part of the full range of possible solutions, NEWWA recommends that it be broadened, made more flexible and more responsive to local environmental and community circumstances.

To address this issue, NEWWA appointed an Ad-hoc Committee of members with expertise in all aspects of the issues involved, assigning them to conduct an independent review of the Policy. After reviewing the policy and pertinent literature, the Committee decided to develop alternative approaches for consideration rather than to simply critique the policy guidance itself. The alternative approach would allow for improved protection and management of the Commonwealth's water resources, while allowing continued economic development, and ensuring water utilities the ability to meet their responsibility to provide a safe and reliable water supply.

Local Water Use Reductions Need to be Tailored
An effective policy must involve all aspects of water use. If efforts to manage water withdrawals are necessary, those efforts must recognize that water use is made of more than just two components (residential use and unaccounted for water). In reality, water use includes residential use, commercial use, industrial use, institutional use, municipal use and whatever real losses there are in the distribution system between the source and users. Even more important would be the establishment of local goals for each of the components of water use. If water use reductions are an appropriate strategy to respond to a particular water resource issue, a community should be able to choose to set local goals for residential use, for commercial use, for industrial use, for institutional use, for municipal use or for real losses in the distribution system between the source and users. These goals and programs to achieve them must be based on the local situation and the best opportunities for effective and cost-effective changes if meaningful, permanent, long-term movement towards the underlying water resource goals is to be achieved.

Key Areas of Focus
Based on these issues, the Ad-hoc Committee identified several key areas of focus, as follows:

- Water conservation is an important and necessary objective, with broad support by the waterworks profession. This is proven by the successful implementation of water conservation measures and resulting reductions in water use by numerous utilities throughout the Commonwealth.

- Protection of streamflow, while an admirable goal, cannot be accomplished merely by regulating public water supply withdrawals. Such an objective requires

reconsideration of the Commonwealth's approach to commercial/industrial and residential development practices, as well as alternative management strategies for wastewater and stormwater. The narrow focus on water conservation and permit restrictions for water systems can not achieve the desired goal of streamflow protection, yet is costly and difficult for many systems to implement, resulting in a very low cost-benefit for the Commonwealth's citizens. We prefer to focus on goals that can be accomplished and will be effective.

- The use of an unaccounted-for water (UAW) percentage[1] is inconsistent with worldwide best management practices and direction, in that a better gauge of performance is estimated unavoidable annual real losses (UARL). Apparent losses or 'paper' losses, while a part of UAW, are unrelated to actual water withdrawals[2].

- In its current form, the Policy discourages long-term planning for water systems, instead meting out water in tiny increments that often have water systems repeatedly seeking increases at no small cost to ratepayers. Economic development can be stifled as water systems struggle to meet the requirements, yet still get little in return at the end of long and costly battles to achieve the standards. The permitting of water withdrawals should consider this economic impact on communities, their desire for growth and the General Court's legislative policies and direction on growth. For example, the WMA's methods for determining population projections to establish a permittee's allowable withdrawal limit is at odds with the Commonwealth's push for affordable housing in that the 40B rules allow rapid and dense growth. Water suppliers are part of the growth process and must have significant input into the projection and forecasting of how much future growth they will need to serve. To this end, the Association believes that all projections for water demand should be based on Regional Planning Agency projections that are done with the input of the communities. Further, projections need to be revised whenever the legislature passes a law or policy that impacts growth.

- The concept of "offsets" to improve the hydrologic water balance on a local and regional basis is a positive approach. The implementation of offsets, however, should be recognized as a community-wide goal to improve water resources management overall. The use of a permittees 3-year average to set a baseline that would trigger an Offset Feasibility Study and subsequent implementation seems to add needless regulatory review and expense to communities. Therefore, an

[1] Recent research has found that the practices of calculating "unaccounted-for" water varied so widely in utilities around the world that the term has no consistent meaning. Other methods that account for all water are replacing the use of unaccounted for water.

[2] It is important, and a recognized goal, that water systems account for all real uses of water by metering, estimates or audits in order to understand and manage their systems effectively, and to establish equitable charges for use. However, this is a system and rates management issue, not directly a water resource issue.

alternative approach is required, such that water supply utilities and the rate payers are not asked to bear the burden of offset implementation throughout a town or region. Instead, the Association suggests offsets that are not triggered by a baseline but are instead used as part of a toolbox described further in a later section of this report.

- The "stressed basin" concept was developed by simply comparing rivers and streams relative to one another with regard to flow. A more appropriate analysis would consider the hydrogeologic regime of each river, with an assessment of declining streamflows over time. Only then could it be realistically determined if a given river is in need of streamflow restoration.

- A single statewide standard for residential per capita use is an inappropriate policy tool for effective water management. Such a one-size-fits-all approach ignores the real and important differences in demographics, land use patterns, and local soil and climatic conditions among communities. While it *may* be appropriate to adopt state-wide goals, regulatory standards must account for these legitimate differences in water use patterns. There is already substantial precedent for having policy goals and separate enforceable standards under the Safe Drinking Water Act. A goal, such as a maximum contaminant level goal, is an unenforceable policy statement. It is a desirable outcome, but cannot drive mandatory actions. By contrast, a standard is enforceable, and will drive obligatory investments of municipal and private resources. Standards must account for local circumstances, must reflect the relative effectiveness of the approach at achieving the underlying water management goal, and must account for cost-effectiveness of the approach compared to other ways the underlying goal might be achieved.

- It is critical to recognize that the state's average rainfall ranges from 41 to 53[3] inches per year depending on location, more than enough to satisfy both environmental and economic/community needs. Focus on recovery and reuse of this runoff represents common ground in that it will benefit streamflow, the environment and drinking water far more than any other approach.

- There are numerous stakeholders that have interest in the development of water policy in the Commonwealth. Going forward, increased and substantive involvement by all stakeholders – utilities, environmental groups, regulators, business representatives, municipal officials, and engineers/scientists - is necessary to ensure a workable policy that is mutually acceptable and effective.

[3] Source: Daly and Taylor, 1998.

The Existing Situation for Water Supply Withdrawals

The permit limits imposed under the WMA are based on the classification of the user's basin (e.g., high, medium or low stressed basin). During WMA reviews, the impact of the existing or proposed water supply withdrawal is *estimated* based on the *assumption* that the entire withdrawal volume is taken directly out of the nearest stream, which is only true for diversions but not groundwater supplies. This falsely implies that a direct one-to-one relationship exists between well withdrawals and streamflows. The implied relationship also mistakenly places all responsibility for streamflow issues on the permit holder, whether or not there are other causes such as large volumes of stormwater from extensive developments that may reduce baseflow and scour stream channels during increased high flows.

In reality, each situation is dependent on localized, complex hydrogeologic conditions that are difficult and expensive to measure or model. The total water withdrawal is utilized for domestic water use, commercial and industrial uses, outdoor water use, water main flushing, backwashing of filters, fire fighting, and non-revenue water – all used in various proportions depending on the system's size, demographics, land use, system age and many other factors. Most communities continually strive to reduce their non-revenue water as a good management technique, knowing that it makes sense to increase the efficiency of the system to enhance the revenue producing portions so that system improvements can be supported.

Significant problems can occur when the utility is not allowed to manage their demand in concert with other water components in the overall water balance. For example, extensive flushing of the water mains in an older system may be crucial to maintaining high water quality. In these same older systems annual capital improvements of the distribution system to reduce continually appearing leaks may amount to many millions of dollars, and if the flushing is returned or recharged, why consider the withdrawal part of the utility's allotted withdrawal limit? The same argument applies to water used for actual fire fighting and training drills. These demands are predicated on maintaining the public safety and not under the direct control of the water utility. Public health and safety should not take a back seat to streamflow. Instead, water systems need flexibility to effectively manage all of these factors using the Best Management Practices adapted to that system's particular issues and configuration.

It seems more reasonable that total water withdrawal should include both revenue and non-revenue water, with further consideration given to the utility that can document impact on the overall water balance of their community based on their system's unique characteristics.

Another important consideration is management of environmental impacts by withdrawing from sources based on the time of year and their location. Both daily and seasonal variation in the use of groundwater sources is physically and economically important to the utility, and multiple wells would be a great potential benefit to streamflow. Yet redundant wells intended to provide flexibility and reduce

environmental impacts are difficult to permit in the Commonwealth today due to the WMA and the Interbasin Transfer Act.

After reviewing the policy and relevant literature, listening to comments by members and others and discussing all of these issues, the New England Water Works Association (NEWWA) has come to the following conclusion. The issues are complex and there are many valid points that have been made regarding the present Policy. We feel the present version of the Policy will not be effective in accomplishing what have been the stated goals. A more comprehensive and current approach must be taken. We have developed the following recommendations as a more comprehensive approach to the issues. We believe after an open review they could have more support among all stakeholders and will be more effective at accomplishing the stated goals.

Recommendations

1. Uncouple Streamflow from the WMA Permits

As described above, NEWWA believes that using the Stressed Basin Report as a tool to identify permit limits is flawed, since the imposed limits will not affect the classification of the basins. For example, the new WMA permitting policy focuses on stringent conservation and operational measures for permittees in high and medium stressed basins, but the imposed measures will have little or no effect on streamflow except in rare cases. Conversely, the penalties for falling outside the policy elements are costly for both water systems and Mass DEP in terms of Administrative Consent Orders, repeated permitting efforts and staff time.

The NEWWA recognizes that conservation is operationally desirable, but is concerned that its close alignment with the Stressed Basins report[4], streamflow monitoring, or simple water budgets[5] will provide a false sense that progress is being made in protecting streamflows when in fact water conservation has minimal impact in maintaining and/or

[4] The 1999 work plan for the Massachusetts Water Resource Commission (WRC) directed an interagency committee to define a stressed river basin. According to the report issued by the committee, the interim method for applying the stress definition involves the comparison of median low flow statistics for 72 stream gages in Massachusetts. That is, hydrologic stress is defined as the relative strength of rivers in Massachusetts. Only a limited attempt was made to evaluate historical records of streamflows to determine if flow statistics had any change over time. No attempt to include differences in surficial geology was taken into account. No examination of the actual ecological health of the river was undertaken. Finally, in basins where multiple gages exist, if the furthest downstream gage indicated high stress, potentially contradictory data from upstream gages was disregarded, in effect holding upstream communities hostage.

[5] The self-described "simple water budget" method to determine if a sub-basin is hydrologically stressed guarantees that virtually no sub-basin that has a municipal water withdrawal can be classified as "low stressed". The simple water budget is a desktop exercise that completely ignores the on the ground reality of stream condition and health. There was also no attempt made by the interagency committee to quantify septic recharge by sub-basin.

restoring streamflows. If the goal is to improve streamflow, then better tools, ones with a more direct impact, must be used.

The NEWWA also believes that the use of the streamflows and the Stressed Basin Report as the backbone of the Water Management Act Policy will lead to future tightened restrictions on suppliers with no results on improving streamflows.[6] Unless the Stressed Basin Report is amended with trendlines over time, its use simply diverts attention from more significant problems such as changes to the hydrologic cycle caused by development. We wonder why trendlines were not used unless it is because they were too difficult to see, and if so, how will any future improvements be evaluated? We believe that the resources being applied by water systems, regulators and others on this diversion lead to delays and a worse environmental outcome than if the same focus were put on a more effective program.

As a result, NEWWA recommends that the provisions linking the WMA policy to streamflow only be applied where proven directly applicable. Summer watering restrictions should be unique to each basin and based on groundwater levels, weather and drought warnings. In these ways, the Commonwealth's citizens can be brought into the picture of how their water supply use affects water resources.

2. Use Realistic Benchmark Goals and Effective BMPs

Instead of linking the permits to indirect, ambiguous factors such as streamflow and the Stressed Basin report, NEWWA recommends that benchmark goals should be linked to more reliable and measurable factors such as system size, age and demographics. These factors can significantly affect realistically achievable outcomes and can result in a direct impact on water use.

[6] The acknowledgement that "stream flow records display obvious trends as a result of changes in land use in the catchment, diversions for irrigation or other purposes, construction of reservoirs, etc." (Linsley, R.K., Jr., M.A. Kohler, and J.L.H. Paulhus. 1982. Hydrology for Engineers) and inclusion of time series data in the hydrologic assessment process has been common practice in the field of stochastic hydrology for decades. If no changes in stream flows are observed, then increased withdrawals would not appear to be reflected in the historical record of stream flows. Conversely, reduction in withdrawals would also not be reflected in measured stream flows.

3. Use International Standards to Address Factors Important to WMA

In lieu of the terminology and widely varying definitions of unaccounted for water, NEWWA recommends a statewide definition of Water Loss Control terminology be established, accepted and understood. We recommend the use of the *AWWA Water Loss Control Committee Report* published in August 2003.[7] In this way, real losses can become the focus instead of the many operational and system factors that are not germane to the WMA (e.g., paper losses).

4. Allow Redundant Wells to Minimize Pumping Impacts; Protect High Yield Aquifers

The NEWWA understands why new wells or wells close to streams need to be evaluated for impacts on streamflows, especially during dry periods, however, the assumption that all of the well's withdrawal will reduce streamflow by an equivalent volume is overly conservative for many periods of the year, needlessly eliminating some potential well sites. The high and medium yield aquifer maps from USGS provide a better measure of whether a site may be viable, since the aquifer's characteristics and storage potential are also of significant importance. By focusing on the streams only, many of the best sites that could provide good yields without impacts on the stream go untapped and may become permanently unavailable due to development pressures of the community.

High yield aquifers are important to protect. As development encroaches, these important aquifers may be permanently lost to the community. Over time, this loss of potentially good sites will result in overuse of other sites, with negative impacts on both humans and the environment. Everyone's time and funding would be better spent on protection of the remaining high yield aquifers as these cannot be recovered easily once they are lost to housing, roads and industrial/commercial land uses.

Further, allowing redundancy through multiple wells to reduce the impact of pumping on any single point makes sense for both public health and safety and environmental protection. Additional wells would encourage redundancy and pumping of the wells that have the least impact on streamflows over key time periods, all within the overall withdrawal volume. NEWWA recommends that the MassDEP Screening Policy, the New Source Approval process and the Interbasin Transfer Act permit process be streamlined to recognize the importance of high yield aquifers to water supply safety and redundancy, allowing use of these areas for the future before they are all lost.

---

[7] AWWA's Water Loss Control Committee published a committee report in the August 2003 edition of *Journal AWWA* entitled "Applying Worldwide Best Management Practices in Water Loss Control." This report supports the use of the International Water Association /American Water Works Association Water Audit Method as the best practice method to audit drinking water supplies. A fundamental concept of this method is that all drinking water can be accounted-for, via metering or estimation, as either a form of consumption or a loss. Hence no water is "unaccounted-for". The Water Loss Control Committee recommends against the continued use of the imprecise term "unaccounted-for" water, referring instead to the specifically defined Non-revenue water, included in the IWA/AWWA Water Audit Method. Source: American Water Works Association.

5. Use Site-Specific Hydrologic Balances to Evaluate Projected Results

If the objective is to encourage communities to manage water thoughtfully and to the fullest extent possible, then an effective methodology would be to use a hydrologic balance for the municipality or basin that allows the flexibility of applying the most applicable and beneficial tools to achieve this objective using site-specific factors (e.g., stormwater recharge, wastewater recharge, Low Impact Development[8], recycle/or reuse of wastewater, etc.).

The hydrologic balance would not be linked to streamflow because of the unknowns and cost of establishing defensible data for each stream and community. Instead, the hydrologic balance[9] could be used as a method of encouraging more attention to thoughtful and effective methods that would be outlined in a WMA "Toolbox" of implementation options that are all geared to the objective. Options could be quantitatively assessed in some cases, using available GIS databases of soils and depth to groundwater combined with information and quantification of recharge from onsite septic systems, pre-engineered wastewater treatment/on-site, recharge systems and the local regulatory policy and zoning instruments. Further, the hydrologic balances should not be the sole responsibility of the water department or water district, but instead should be shared amongst the community and the state. Ideally, the hydrologic balances could be done on a watershed basis.

There is increasing recognition that increased rates of stormwater run-off is one of the key factors in streamflow declines in that increased runoff and flashy watersheds can significantly reduce groundwater levels and baseflow, as well as erode stream channels during high flows. Yet, considerably more state funds are being spent on pursuing water systems that have significantly less control over streamflow. These limited funds could be better spent on tackling issues that will have more impact, for example, a more vigorous stormwater policy that applies statewide to new developments and provides incentives for upgrading existing developments. Similarly, the state plumbing code would be a good place for change in terms of water conservation, rather than requiring each municipality to tackle these issues without assistance.

[8] Low Impact Development (LID) is an innovative stormwater management approach with a basic principle that is modeled after nature: manage rainfall at the source using uniformly distributed decentralized micro-scale controls. LID's goal is to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. Source: Low Impact Development Center Inc.

[9] Lancaster, MA Pilot Environmental Overlay Districts, 2006, Massachusetts Riverways Program.

6. Develop a WMA Toolbox

NEWWA recommends that the Massachusetts Water Management Policy allow water suppliers to use a "Water Management Toolbox" (Toolbox). This toolbox would allow water suppliers to select various techniques to promote overall best management practices for water management. Use of a similar toolbox was recently promulgated by the EPA in January 2006 under the Long Term 2 Enhanced Surface Water Treatment Rule (LT2), described in the footnote below[10]. In general, having choices and flexibility in implementation has been much better received by water systems than a command and control approach.

The toolbox is part of EPA's targeted approach to risk reduction in the new LT2 rule. EPA recognized that its prior rules contained essentially a proscriptive, one-size-fits-all approach, and that such a one-size-fits-all approach to water treatment without regard to source water quality meant that some systems were allocating too many resources to treatment, and others might have too much risk[11]. The new rule requires that the degree of risk reduction required be tailored to the actual observed risk of *Cryptosporidium* in the source water, and that the actual means of achieving that degree be flexibly supplied by use of a combination of tools from the "toolbox".

Water Management Act Policy issues also need solutions that have been developed with the stakeholders involved to be effective. The present policy is a top down approach and lacks the necessary support.

7. Set up a Stakeholder Group to Agree on the Specifics

The LT2 rule was developed by a structured stakeholder process under the Federal Advisory Committee Act (FACA). The FACA process allowed the various interests to come to the table, work together and agree to a framework for the new rule. All the key elements including abandonment of the one-size-fits-all approach, the tailored risk reduction strategy and the use of the toolbox arose out of that collaborative approach.

[10] The LT2 Rule was promulgated to provide additional protection to the public by requiring additional levels of inactivation and removal of Cryptosporidium from drinking water for sources that contain higher levels of Cryptosporidium. Water suppliers must first sample for Cryptosporidium in their water supply to determine which of four treatment bins they fall under. Bin 1 requires no additional treatment, while Bin 4 requires the most additional treatment. Water suppliers are allowed to choose treatment techniques from a microbial toolbox that provide varying credits of treatment to meet their Bin requirements.

[11] Draft Report on Research to Support Rules, EPA, November 12, 1997

For this reason, we also recommend that a group of stakeholders with a specific set of performance outcome goals and time frame be established to finalize the Water Management Act Policy and toolbox, similar to the process that generated the LT2 regulation. This stakeholder group would be set up on a temporary basis with its main goal of making a recommendation for the WMA Permitting Policy. The current impasse among stakeholders on this issue is unlikely to be resolved unless all parties can come to the table in a constructive, structured setting with the goal of developing a workable and effective framework. A professional independent facilitator, a specific consensus-based process, balanced participation and appropriate ground rules will be needed.

In addition, the establishment of a Water Management Science Advisory Committee is recommended to provide the stakeholders group with the scientific foundation for the draft policy. The final draft policy would then be subject to the full rulemaking process including notice, distribution to the regulated community and other stakeholders, public hearing, public comment, revision as warranted and adoption.

The Stakeholders Group should be made up of similar representation as the Water Management Act Advisory Committee but the individual selections should be made by the group to be represented. Specific recommendations put forward must have technical support and must be reviewed by and sanctioned by the Water Management Science Advisory Committee described below. Consensus building will guide the decisions.

The Water Management Science Advisory Committee would be made up of consultants and engineers experienced in municipal water supply, and hydrogeologists, academics and scientists experienced in water supply development, ecology and streamflow analysis. This advisory committee would be charged with identifying areas in need of study, developing project scopes and providing peer review of completed reports. This group would provide technical review and support for the above-mentioned Stakeholders Group. Once the mission of the Stakeholders Group has been completed, it is recommended that this Water Management Science Advisory Committee become an integral component in the Water Management Act Policy to help lend scientific credence to future changes in Policy and to assist in meeting the goals and standards set forth by the Water Resource Commission.

These two groups would provide their report to the Water Management Act Advisory Committee and the MassDEP Commissioner and the policy that would result would have been fully reviewed by the stakeholders as the Massachusetts General Court wrote in the Water Management Act.

Elements of a Water Management Toolbox

In addition to the recommended stakeholder process, NEWWA offers the following suggestions and ideas on what such a water management tool box might include because there are many potential options to manage water resources and their effectiveness is unique to each water supply system. In order to provide protection to sensitive aquatic ecosystems and provide water for the Commonwealth's future, it will be necessary to

identify which tools are appropriate for each situation and use only those tools that are effective and cost-effective.

No single tool is likely to meet all the needs of a community. Therefore, the most effective means of managing the Commonwealth's water resources is to develop a comprehensive Water Management Toolbox and let the communities and water suppliers decide which combination of tools will best suit their needs. This Toolbox will consist of a set of regulatory, technical and operational techniques that can be applied at the local level to offset any real impacts of water withdrawals and manage and protect streamflows. The development of additional new tools should also be encouraged.

The Toolbox items presented in this report can be used by a water supplier, community or state agency. Some of these tools have previously been identified by the USGS in regional studies conducted in Massachusetts. A brief description of these tools and how they might be applied is summarized below. They are presented under three headings:

- Reducing Water Withdrawals
- Minimizing Effects of Local Water Withdrawals
- Offsetting Water Withdrawals

It should be noted that hydrologic or hydrogeologic modeling may be needed to quantify the precise potential impacts of some of these tools. However, we are also suggesting that for the purpose of the Toolbox, it may be sufficient to rate each tool for its relative effectiveness in providing benefit to improving the stream flows, as shown in the table at the conclusion of this section.

In essence, the approach recognizes that the stream cannot tell how or why a gallon of water has become available - a gallon of additional recharge is as valuable as a gallon of reduced demand. It is also important to note that the scale of analysis and response can be critical to creative and effective solutions. It may appear that a single municipality has an insurmountable problem, but a more regional or watershed analysis may indicate potential solutions. A lack of water resources in a community otherwise suited by infrastructure availability and environmental considerations for growth may be resolved by regional solutions.

Reducing Water Withdrawals

Using water more efficiently and reducing waste can allow water withdrawals to be reduced while still accommodating all legitimate uses. It is important to note that depending on the particulars of the water systems demand and supply system, some tools may be more implementable or more effective at achieving stream flow improvements. Tools may also differ in being long term vs. short term, seasonal vs. year round or voluntary vs. mandatory. The tools selected by a community would be expected to be tailored to their situation – a community with a streamside well and primarily residential use will require different tools than a community with a large reservoir and extensive commercial development. Below

are examples of some potentially effective tools for reducing water supply withdrawals.

1. Water audits using the International Water Association (IWA) Water Audit Method (endorsed by the AWWA Water Loss Control Committee). With this method, the utility would estimate system-specific unavoidable annual real losses (UARL) for comparison with the system's annual real losses. To assess the economic impact to the utility, the method includes a cost accounting of water losses. The utility can then prioritize its goals to improve both system efficiency and economics, by such other measures as leak detection and metering improvements. (Note that metering improvements and audits are only tools to better account for use and potentially to prioritize leak detection – not water savings technologies in their own right.)

2. Leak detection and repair.

3. Rate and billing structures which encourage conservation, including:
   a. Quarterly or in some cases monthly billing (automatic meter reading may facilitate this)
   b. Descriptive bills with use history and use in gallons (perhaps even community per capita goals)
   c. Full cost recovery
   d. Seasonal surcharges for increased use
   e. Increasing block rate structures (if applied appropriately)

4. Indoor demand management programs for residential users including:
   a. Educational efforts
   b. School Education programs
   c. Household leak detection education
   d. Water saving device giveaways or installation
   e. Incentives for low flow or ultra low flow toilet installation (rebates, etc)
   f. Incentives for high efficiency clothes washers

5. Outdoor demand management including:
   a. Educational efforts
   b. School education programs
   c. Outreach to local landscapers, suppliers, garden centers, etc
   d. Publication of irrigation daily needs index
   e. Promote/require better irrigation controls to avoid over watering (i.e., rain sensors)
   f. Landscaping measures that promote/require:
      - Organic soil content and minimum levels of topsoil to help soils to retain water
      - Use of native or drought-tolerant plants
      - Reduction of cleared areas

6. Irrigation alternatives including:
   a. Cisterns, rain barrels, etc. for storage and irrigation
   b. Storm water capture and reuse from paved areas and roofs
   c. Grey water capture and reuse for irrigation
   d. Conversion of wet ponds for irrigation
   e. Reclaimed water stored in ponds or in aquifers

7. Process and other indoor demand management for industrial/commercial uses including:
   a. Water audits or education on water saving opportunities
   b. Facility improvements such as LEED[12] accreditation
   c. Grey water capture and reuse for toilet flushing

8. Land use pattern changes including:
   a. Low Impact Development (LID) measures
   b. Higher density, with less private open space, less paved area per unit

9. Further changes to the plumbing code

10. Mandatory Restrictions (only under extraordinary circumstances)

<u>Minimizing Effects of Local Water Withdrawals</u>

1. Limiting use of near-stream wells during low flows. Since wells closer to streams sometimes have a more direct and immediate impact on the stream, water suppliers that have multiple wells could potentially manage the use of these wells so that near-stream wells are utilized only during periods of high flow and wells more remote from sensitive streams could be used during periods of low flow.

   An example of a potential application of this approach would be the Town of Hamilton which has one well immediately adjacent to the Ipswich River and three wells in the Idlewild Brook sub-basin. According to the USGS model of the Ipswich River Basin, Idlewild Brook does not provide stream flow to the Ipswich River during low flow periods (typically in the summer and early fall). The water supply system could be managed so that the well adjacent to the Ipswich River would remain off-line during the summer months and used during high flows. This relatively simple procedure would significantly reduce the impacts of Hamilton's water use on the Ipswich River.

   In situations where all of a water supplier's wells are located near sensitive streams it may be advisable to look for additional water sources more distant from streams, if any aquifers are available, so that the supplier can rely less on near-stream wells during low flow periods. Water suppliers should be

[12] LEED stands for Leadership in Energy and Environmental Design, a voluntary, consensus-based national standard for developing high-performance, sustainable buildings.

encouraged to augment their water supply wells to allow them to manage demand in this way.

2. Using wells that are upgradient of large ponds or lakes. These wells sometimes have lower impacts on stream low flows, as the pond or lake dampens out flow variations. This principle can be applied in a manner similar to the previous "tool." Water suppliers may then be able to rely on wells upgradient of major ponds during low flow periods. If potential sources exist in locations upgradient of major ponds, the water suppliers should consider installing supplemental wells in these locations.

3. Conjunctive use of multiple supplies -- Use optimization models to determine the most effective approaches to water management within a community. For aquifers in which a groundwater or hydrologic models are available (and this is becoming more and more common) those models can be used to efficiently evaluate water management options. Various water management options (primarily the timing and location of water withdrawals) can be simulated to determine the scenario that results in the least adverse impact on stream base flow. The low flow improvements can then be compared to flows under typical pumping scenarios to determine the amount of potential improvement.

4. Regional Cooperative Resource Management – Public water supply is not the only use of water resources, there are also agricultural uses, golf courses, industrial uses etc. Among WMA permit holders including public water systems, agricultural users, nurseries, golf courses, etc**.** the water management options described above could in many cases be applied more effectively among groups of water users within a given basin because there would be more sources and more sites that could be managed in terms of timing and need. This is particularly true if ground water and surface water supplies can be conjunctively managed, especially if there is substantial storage available to dampen out seasonal or inter-annual variations in impacts to stream flows. The use of Decision Support Systems may be of value in establishing regional cooperation such as interconnections.

5. Regional conjunctive use of multiple supplies in different basins to accommodate larger populations that may exceed local supplies.

<u>Offsetting Water Withdrawals</u>

1) Modifications of local regulations on stormwater recharge requirements to address new runoff created by imperviousness and the loss of both the original recharge and the original evapotranspiration. This could occur through requirements for high infiltration rates in A and B soils (1.25 and 1.0 inches respectively) to increase total recharge wherever appropriate in either new or redevelopment situations.

2) Discharging treated wastewater close to streams or upgradient of sources provides more direct improvements to low flows than those farther from streams or downstream.

3) Any and all discharge water (stormwater, roof drainage, impervious areas, wastewater, and clean process water) should be directed to aquifer areas for infiltration after suitable treatment (including designated Zone II recharge areas which is problematic given current regulatory policies).

4) Storm water treatment to improve water quality.

5) Reducing peaking times with extended detention structures can benefit streamflow in the short term.

6) Changes to land patterns to allow more recharge including:
   Low Impact Development
   a. Reduced paving requirements
   b. Requirements for on-site storm water management

7) Skimming off the high flows of streams and returning flow to aquifers or to offline reservoir storage may be viable in some basins.

8) Conversion of detention basins to recharge basins

9) Seasonal transfer of water to existing lakes or ponds with available storage capacity for later use during periods of high demand or periodic drought.

10) Reduction in infiltration/inflow to sewers particularly those where the treated discharge is downstream or out of basin.

Relative Efficacy of Tools in the Water Management Tool Box

NEWWA recognizes that the relative effectiveness of the tools may vary significantly based on their site specific use and locations, so no attempt has been made to categorize these tools. Instead, the effectiveness should be judged by each community based on their specific situation.

Water Management Act Toolbox

Tool Category	Tool
Reducing Water Withdrawals	Water Audits
	Leak Detection and Repair
	Rate and Billing Structures
	Residential Indoor Demand Management
	Outdoor Demand Management
	Irrigation Alternatives
	Non-Residential Indoor Demand Management*
	Low Impact Development
	Additional Plumbing Code Changes
	Mandatory Restrictions*
Minimizing Effects of Local Water Withdrawals	Limit use of near-stream wells during low flow periods
	Use wells upgradient of lakes
	Conjunctive use of multiple supplies within a community
	Conjunctive use of multiple supplies within a region
	Conjunctive use of multiple supplies regionally in different basins
Offsetting Water Withdrawals	Increased stormwater recharge[13]
	Local wastewater discharges
	Infiltration of all discharges
	Stormwater treatment
	Extended detention
	Low Impact Development
	High flow or flood skimming
	Seasonal transfer to lakes and ponds
	Convert detention ponds to recharge
	Reduction in inflow/infiltration to sewers

The New England Water Works would like to recognize the many individuals and groups who have preceded us in developing, researching and evaluating the *Massachusetts DEP's Guidance Document for Water Management Act Permitting Policy*. Clearly, our Committee benefited from the many hours already spent analyzing this guidance document and its inception. The goal of our Committee has not been to address the regulatory process or legislative issues that have created some controversy in themselves. Rather, we have tried to propose a way to move forward in crafting a policy that provides public water suppliers with flexibility in implementing local controls to best manage our valuable water supplies.

[13] Assumes highest recharge requirement of 1.25 inches for A soil, 1 inch for B soil. Only medium results gained from adopting Stormwater Policy community wide.

This report was submitted to NEWWA's Board of Directors with the support of all the following members of the Ad Hoc Committee.

New England Water Works Association
Ad-hoc Committee on Massachusetts Water Management Act DEP Policy 2006

Ms. Barbara Cook P.E. Committee Chair and member NEWWA Board of Directors
Associate
Weston & Sampson Engineers

Ms. Jane Ceraso
Environmental Manager
Acton Water District

Mr. Savas Danos
General Manager
Littleton Water Department

Mr. Stephen Estes-Smargiassi
Director of Planning
Massachusetts Water Resources

Mr. Eric Hooper
Superintendent of Public Works
Town of Sharon

Mr. Andrew B. Miller P.E., PHG
Principal Engineer
CDM

Ms. Eileen Pannetier
President
Comprehensive Environmental Inc.

Mr. Raymond Raposa
Executive Director
New England Water Works Association

Mr. Jeffrey Rose
Assistant Water Superintendent
Sandwich Water District

Mr. Jesse Schwalbaum
Senior Hydrogeologist
Watershed Hydrogeologic, Inc.

Dr. Ronald Sharpin P.E., Ph.D.
Holliston Water Superintendent
Holliston Water Department

Mr. Adam F. Yanulis (Ex-officio)
President
New England Water Works Association
Association

Ms. Jennifer Pederson (Ex-officio)
Executive Director
Massachusetts Water Works

New England Water Works Association
Board of Directors Reviews of the Report from the
Ad-hoc Committee on Massachusetts Water Management Act DEP Policy 2006

Mr. Robert Beaurivage
Assistant Director
Manchester Water Works
Manchester, NH

Mr. James West
Director of Operations
Portland Water District
Portland, ME

Mr. Patrick Connelly
Senior Vice President
Weston & Sampson
Peabody, MA

Mr. Anthony Zuena P.E. (Anthony)
President & Chief Executive Of
SEA Consultants, Inc.
Cambridge, MA