ACTON BOARD OF HEALTH

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Town of Acton
Comprehensive Water Resources Management Plan
Citizens Advisory Committee
Indirect Potable Reuse Working Group

Meeting #4
8/18/2005
Acton Wastewater Treatment Plant
20 Adams Street

Call to Order 730pm

I. Introductions

II. Plant Tour

III. Minutes from 6/30/05

IV. Update on Reuse Activities

V. Review of articles from 6/30/05 meeting

VI. Review of new Articles

a. Discussion of the four major topics

1) Emerging contaminants – detection and removal
2) The timing of the implementation of the project and coincidence with regulatory, treatment technology, and political timelines
3) Source reduction efforts for water use and pollutant removal
4) Centralized IPR versus Decentralized IPR

VII. Future meeting dates, sites, and topics

Adjourn by 900pm

Indirect Potable Reuse

For more than 50 years, California has been a pioneer in water recycling. Advances in technology and new philosophies about preventing the "waste" of water have combined to make water recycling an increasingly important part of water resources planning. The next challenge is to expand the existing uses of recycled water to encompass potable reuse (drinking, cooking, and bathing). Direct potable reuse – where the product water is released into a municipal distribution system immediately after treatment – is practiced only in Windhoeck, Namibia at this time and is probably far in the future in the U.S. However, indirect potable reuse is more widely practiced and becoming more accepted. The following paragraphs provide an overview of the principles involving indirect potable reuse.

What Is Indirect Potable Reuse?

With indirect potable reuse, a highly treated recycled water is returned to the natural environment (groundwater reservoir, storage reservoir, or stream) and mixes with other waters for an extended period of time. Then, the blended water is diverted to a water treatment plant for sedimentation, filtration and disinfection before it is distributed. The mixing and travel time through the natural environment provide several benefits: (1) sufficient time to assure that the treatment system has performed as designed, with no failures, (2) opportunity for additional treatment through natural processes such as sunlight and filtration through soil, and (3) increased public confidence that the water source is safe. Unplanned indirect potable reuse is occurring in virtually every major river system in the United States today.

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What Technology Is Used to Treat Water for Potable Reuse?

Membrane treatment is the most advanced technology for removal of the tiniest particles – including small ions such as sodium and chloride – from the recycled water. The most common membrane process employed is reverse osmosis (RO). Under relatively high pressure, water is forced across the semi-permeable RO membranes in special vessels to produce nearly pure water. Impurities are collected in a separate brine stream for disposal.

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How Proven Is Indirect Potable Reuse?

The Denver Water Board, with assistance from the U.S. Environmental Protection Agency, conducted an intensive study of potable reuse, using a one million gallon per day pilot plant for five years. Several combinations of treatment processes were tested, and potable water was produced and analyzed for nearly all known contaminants. In addition, feeding studies were performed on rats and mice. Over several generations, rats and mice were given recycled water concentrates, while similar control groups were given water concentrates from the snowmelt from the highest peaks of the Rocky Mountains. No significant health differences were found between the two groups.

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What Are Some Examples of Indirect Potable Reuse?

For more than 20 years, the Upper Occoquan Sewage Authority (UOSA) Regional Water Reclamation Plant has been discharging to the Occoquan Reservoir, a principal water supply source for approximately one million people in northern Virginia. Because of the plant's reliable, state-of-the-art performance and the high-quality water produced, regulatory authorities have endorsed UOSA plant expansion over the years to increase the safe yield of the reservoir. UOSA recycled water is now an integral part of the water supply plans for the Washington metropolitan area. Other major projects with proven track records are in Los Angeles County and Orange County, California, and in El Paso, Texas.

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What Are the Regulatory Controls for Indirect Potable Reuse?

A basic regulatory structure for water recycling and reuse projects has been in place in California since 1969. However, projects involving indirect potable reuse were traditionally evaluated on a case-by-case basis, making it difficult to plan for this type of water recycling application. A breakthrough occurred in January 1996 when a regulatory framework for potable reuse was adopted by a Committee convened jointly by California's Department of Health Services and Department of Water Resources. Eighteen individuals, representing these Departments and major water supply and sanitation organizations, signed the framework. The framework establishes six criteria that must be met before a potable reuse project proceeds. With these "ground rules" in place, agencies will find it easier to evaluate the feasibility of implementing an indirect potable reuse project.

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What Are Multiple Barriers?

One of the most important concepts contributing to the growing acceptance of indirect potable reuse is that of multiple barrier protection. While RO is the heart of a potable reuse process, several other treatment processes are normally added to provide as near a fail-safe system as humanly possible. Primary and secondary treatment, dual media filtration, chemical additions, disinfection, and pretreatment are provided prior to the RO step. Each of these treatment steps removes a certain portion of the initial concentration of microorganisms and pollutants in the water. Additional removal capabilities follow. This combined treatment capability not only adds up to an impressive cleansing power, but also act as back-ups to one another in case any step in the system fails to perform. Storage is also viewed as an important barrier to contaminants. In addition to multiple-treatment processes, multiple barrier protections also include source control programs (preventing introduction of pollutants at the source) and strict operations and maintenance procedures.

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FACT sheet

WERF

Definitions:

- **Effluent** - treated water leaving a wastewater treatment plant.
- **Endocrine system** - a network of glands that produce hormones which react with receptors to regulate biological processes.
- **Estrogen** - a hormone produced primarily in female sex organs responsible for expression of female characteristics.
- **Hormone** - a "chemical messenger" produced by a gland that travels through the blood to another organ, regulating the activity of that organ.
- **Risk assessment** - a process used to estimate the possible risks to human health or the environment by considering who might be exposed to a compound and what the effects of that exposure might be.

Endocrine Disrupting Compounds and Implications for Wastewater Treatment

What are Endocrine Disrupting Compounds (EDCs)?

Endocrine disrupting compounds (EDCs), sometimes also known as hormonally active agents or endocrine modulating compounds, are substances that can affect the endocrine system in humans or animals, including fish (see definition at left). This fact sheet uses the term endocrine disrupting compound because it is currently the most commonly used term, not necessarily the most scientifically accurate one.

EDCs can be natural or manmade chemicals. Most chemicals are not EDCs. For more information on the endocrine system and hormonally active agents, see http://www.epa.gov/scipoly/oscpendo/edspoverview/primer.htm

Where Do EDCs Come From?

Most common EDCs entering and leaving a wastewater treatment facility are naturally produced by plants and animals. Some are found in products we use. New laboratory methods have enabled us to detect these compounds nearly everywhere.

- Plants and plant products and byproducts are primary sources of these compounds. Products containing soy can contain hormonally active agents.
- Humans and other animals excrete compounds that are hormonally active and can be EDCs. These compounds can occur naturally because our bodies produce them or because they are in the milk, meat or vegetables we eat. They can also be in pharmaceuticals such as birth control pills.
- Plastics, and the manufacture of plastics, can release compounds called plasticizers, some of which are EDCs.
- Some pesticides can be hormonally active.
- Detergents contain compounds called surfactants that improve their cleaning power. Some surfactants can be hormonally active.
- Some other industrial products (or their byproducts) can contain EDCs.

Have EDCs Been Measured In Surface Water?

Researchers have found natural estrogens and other compounds that may be EDCs in the surface water near some wastewater treatment plants. In some instances, the measured concentrations occur at levels that have been found in the laboratory to cause effects on a hormone system in fish.

Are There Environmental Effects from Exposure to EDCs in Wastewater?

In Europe, populations of some fish species near some wastewater treatment plants have shown a range of effects attributed to compounds acting like the hormone estrogen. The specific compounds or conditions causing the effects are not clear. For the most part, researchers found the affected fish near treatment plants where the level of wastewater treatment is more limited than it is in the United States. While much of the research on these effects and their occurrence near wastewater treatment plants began in Europe, similar studies are now underway in the United States and there may be a claim of similar effects in the future. To date, no studies in the United States have effectively linked changes in fish populations to wastewater treatment plant discharges.

Researchers are gathering more data on which chemicals are EDCs, the effects they may have at different concentrations, and their fate in wastewater treatment plants and the environment. While those efforts are underway, it is important to understand that many of the EDCs in treatment plant releases occur naturally. The ecological effects attributed to EDCs in the effluents from wastewater treatment plants may, in fact, be caused by EDCs, but they may also be caused by other conditions, such as temperature.

Should the Public Be Concerned About EDCs In Our Waterways?

When people read or hear reports of possible EDC effects in fish or other aquatic life downstream of a wastewater treatment plant, they may wonder whether they should be concerned about similar effects occurring in humans. Two things are important to remember.

First, no studies to date have effectively linked low concentrations of EDCs in wastewater to adverse health effects in humans. So while concern is an understandable response, no data currently show endocrine disruption in humans as the result of using rivers, lakes, and streams. Large studies have not indicated any association with effects that have sometimes been attributed to environmental exposure to EDCs: Low sperm counts, premature puberty in girls, testicular cancer in young men, and breast cancer in some women.

Second, the effects observed in fish and other aquatic organisms downstream of wastewater treatment plants and attributed to EDCs can also have other causes. Temperature can cause some of these changes. They may also simply represent natural variations in a population. That is not to say that the effects cannot be associated with EDCs in the discharge from a wastewater treatment plant. They might be, but clearly demonstrating a link is difficult.

Are EDCs Treated In the Wastewater Treatment Process?

According to published research, the most commonly used treatment approach can remove over 90% of many of the most common EDCs entering a treatment plant. Engineers design municipal wastewater treatment plants to remove conventional pollutants (solids and biodegradable organic material) from sanitary wastewater. Through their normal operation, those plants will also remove many types of EDCs.

What Are the Implications for Biosolids?

According to Merriam Webster's Collegiate Dictionary, 10th edition, the term "biosolids" refers to "solid organic matter recovered from the sewage treatment process" that is often composted and added to soils as a fertilizer. Biosolids may contain trace amounts of hormonally active compounds that were removed from wastewater during treatment. Detailed studies of the potential effects of other EDCs following land application of biosolids are generally not available yet, and understanding what happens to EDCs in solids is a topic of ongoing research.

What Are the Implications for Recycled Water?

"Recycled water" refers to the practice of using treated wastewater to irrigate areas such as parks, golf courses, or agricultural land. As described above, common forms of treatment will remove most of the mass of the EDCs before the water is recycled. However, more research is needed to understand the environmental consequences, if any, of low levels of EDCs in recycled water.

What Are the Implications for Drinking Water?

Some cities and towns draw their water supplies from surface waters that may contain EDCs from upstream discharges. Researchers have not evaluated the potential risks associated with all of the EDCs that may be in such drinking water supplies. Research on this subject continues. One researcher[1] found that environmental residues of 17-alpha-ethinylestradiol, one of the key and most studied ingredients of birth control pills, present a negligible risk to humans.

Why Do Opinions On EDCs Seem to Contradict One Another?

Laboratory and field studies produce data that can sometimes be difficult to interpret and don't easily translate from lab to field. In addition, it is often difficult to specify exactly which compound is causing an observed effect when there are so many variables, such as water temperature or natural variations in fish populations, that might also cause or contribute to an observed effect. Risk assessment, another common study method that scientists use, may predict results that can't be easily proved or disproved.

Also, it is impossible to prove a negative. When researchers find no effect after an exposure to a suspected EDC, that would suggest the absence of an effect. As more

[1] Christensen, F.M. (1998). Pharmaceuticals in the environment - A human risk? Regulatory Toxicology & Pharmacology 28, 212-221.

and more researchers fail to find an association between an exposure and an effect, the scientific community becomes more and more confident that the exposure does not cause the effect. But all those negative results would still not prove the absence of an effect. It is always possible that the next experiment will find an association.

What Are the Regulatory Implications?

The U.S. EPA is at the very beginning of the process of determining if additional requirements to control sources of EDCs to the environment are needed. The U.S. EPA's Regulatory Activities Workgroup is reviewing the authorities that U.S. EPA may invoke to require testing, and are exploring considerations for establishing the process that U.S. EPA will use to require the testing. You can find out more about these programs at http://www.epa.gov/scipoly/oscpendo/edspoverview/primer.htm.

References

AMEC Earth and Environmental produced this Fact Sheet for the Water Environment Research Foundation (WERF).

This Fact Sheet serves as a companion piece to *Technical Brief: Endocrine Disrupting Compounds and Implications for Wastewater Treatment* (stock no. 04WEM6).

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USE OF RECYCLED WATER TO AUGMENT POTABLE SUPPLIES: AN ECONOMIC PERSPECTIVE

INDIRECT POTABLE REUSE - THE INTRODUCTION OF RECYCLED WATER INTO A COMMUNITY'S DRINKING WATER SUPPLY – CAN BE A COST-EFFECTIVE MEANS OF SUPPLEMENTING A COMMUNITY'S WATER SUPPLY

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INTRODUCTION

Maintaining a reliable water supply is one of the most important issues facing California. Many regions of California rely on diverting water from rivers and streams located in other parts of the state or from the Colorado River, a practice that lacks reliability due to droughts and is becoming less acceptable due to our growing awareness of the environmental impacts of these practices.

Recognizing water's importance to the state's economic prosperity and the quality of life enjoyed by its citizens, the California Water Plan focuses on developing a mix of complementary water resources. The state legislature enacted the Water Recycling Act of 1991, acknowledging that recycled water is an integral part of the state's water supply mix and that water recycling should be adopted wherever appropriate. According to the most recent edition of the California Water Plan (Bulletin 160-98), recycled water use in 1995 was 485,000 acre-feet, less than half of the State's goal of 1 million acre-feet per year by 2010.

The majority of municipal wastewater produced statewide continues to be disposed of to the ocean or other saline water body. This untapped resources represents one of the largest potential sources for "new water" in California. Communities throughout the state are planning new or expanded water recycling programs.

Definitions:

Recycled Water – Municipal wastewater that has been subjected to an array of biological, physical, and chemical treatments as necessary depending on the end use.

Indirect Potable Reuse – A particular application where the recycled water (generally having received a substantial degree of treatment) is blended into a community's water supply (via groundwater recharge or surface water augmentation) prior to final treatment and distribution to the customer in the existing water distribution system.

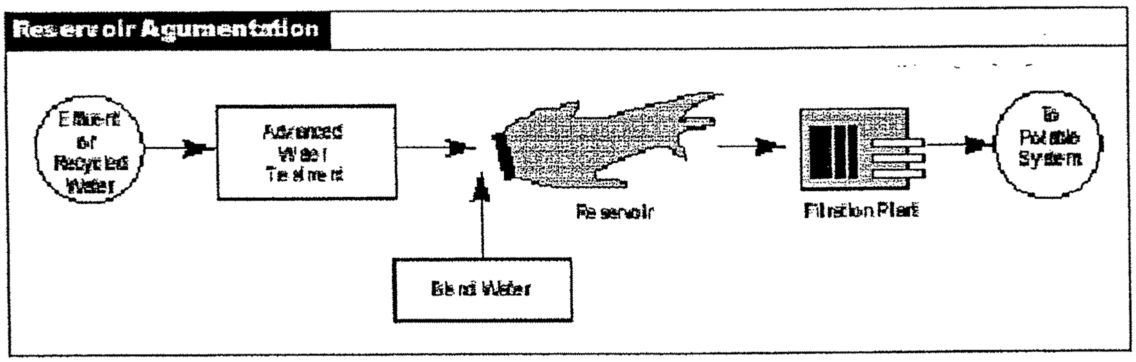
Recycled water is used for a myriad of non potable uses including industrial process, cleaning and cooling water, commercial toilet flushing, aesthetic water features, dust control and fire suppression. Agriculture and landscape irrigation are the predominant non potable uses of recycled water. Urban water recycling projects that rely on landscape irrigation and other non-potable uses often are limited due to the seasonal nature of the demand.

Alternatively, indirect potable reuse – which involves, blending recycled water with other water supplies (groundwater or reservoir) that feed a community's potable water supply system - enables a community to improve recycled water production efficiency and maximize year-around benefits. This use of existing seasonal storage water supply infrastructure enables a community to avoid construction of a separate water storage and delivery system; otherwise needed to provide a customer base and economic viability to a non-potable recycled water project.

Indirect potable reuse projects are in operation in Los Angeles and Orange Counties. And other projects are being considered in the Bay Area and Southern California.

INDIRECT POTABLE REUSE MECHANISMS

Recycled water quality and treatment requirements vary depending on the mechanism used to introduce recycled water into the potable system. Tertiary treated and disinfected (conventional) recycled water is a safe and reliable source for irrigation and industrial applications and some applications that may result in body contact (swimming), but may contain some contaminants that pose a risk to human health if ingested. Conventional tertiary treated recycled water may be used to recharge groundwater supplies if applied via surface spreading and treatment is provided as the water percolates through the soil/aquifer system. To “inject” the recycled water directly into the groundwater basin, or to introduce it directly into a water supply reservoir (upstream of a water treatment plant), additional treatment beyond tertiary is required.



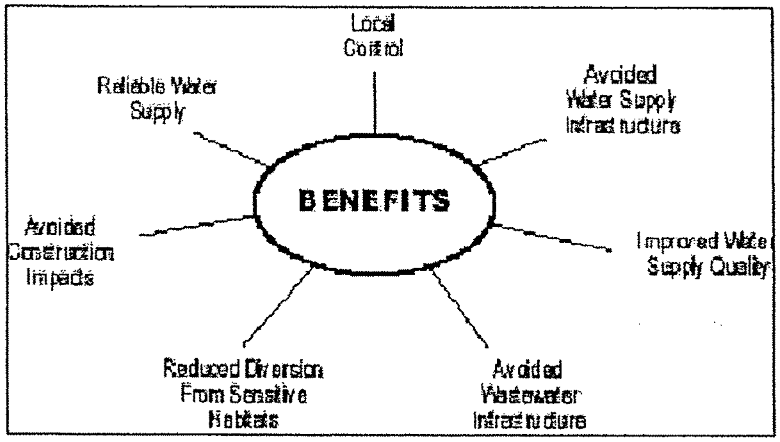
BENEFITS OF INDIRECT POTABLE REUSE

Indirect potable reuse projects provide an array of benefits, some consistent with conventional non-potable applications and others unique to indirect potable applications.

Common Recycled Water Benefits

- Provides a reliable local water supply, which serves a ledge against future droughts and potential uncertainty associated with traditional water supplies.
- Enables some warm suppliers to reduce imports during average and above-average years, and “bank” this imported water for use during dry years.
- Provides economic benefits by retaining businesses, and by attracting new businesses with a reliable water supply, (lower cost?).
- May improve environmental conditions by reducing the need to divert additional supply from sensitive watersheds.
- Reduces the quantity of treated wastewater discharged into the environment.

- May reduce the cost of wastewater treatment and disposal.
- Recycled water projects that include a demineralization step provide a significant enhancement to water quality.
- The yield of indirect potable reuse optimizes a recycled water project through the use of the existing water supply infrastructure, including seasonal storage and distribution facilities.

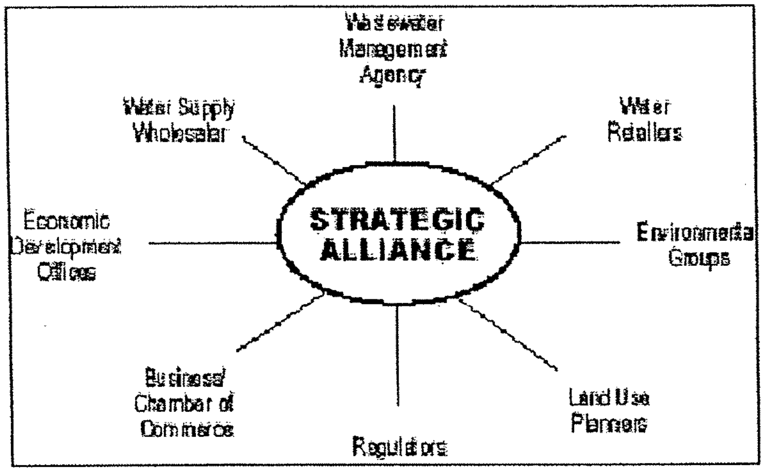


REALIZATION OF ECONOMIC SUCCESS

The economic value of water recycling projects is a function of the potential project benefits and their associated value. A recycled water project is analyzed by comparing the cost of producing and conveying the recycled water to the cost of other new water supply options. Important considerations include reduced or delayed infrastructure costs, improved reliability, savings in treatment costs and environmental benefits. When viewed from this perspective, recycled water projects often are found to provide cost effective new water supplies.

To accurately depict the cost-effectiveness of an indirect potable water recycling project, all potential benefits of the project should be considered. The beneficial effects of a indirect potable reuse project often extend beyond the sponsoring agency, providing regional benefits and in many cases the benefits extend state-wide and beyond. A broad spectrum of stakeholders is needed to provide valuable, consensus-driven input to accurately evaluate indirect potable reuse projects. By venturing outside the sponsoring agency and focusing on institutional relationships, regional and statewide benefits are more likely to be realized. An alliance between the water supply agencies, the wastewater agency, economic development offices, chambers of commerce, environmental interests, state and federal interests such as the CALFED Bay Delta Program, and other stakeholders should be created early in the development of a indirect potable reuse project so that all potential benefits can be considered.

In certain settings, indirect potable reuse projects provide a mechanism for large-scale beneficial use of recycled water with relatively modest additional infrastructure requirements. With a broad spectrum of stakeholders identifying the full array of economic and environmental benefits, indirect potable reuse can provide a cost-effective path for a community to follow in pursuing its recycling ethic.



Three indirect potable reuse projects have been proposed that would exemplify this critical mix of size and breadth of benefits: the East Valley Water Recycling Project, the Orange County Groundwater Replenishment System, and the San Diego Water Repurification Project. These three projects represent varying stages of planning and implementation. The East Valley project is nearing completion of construction. The Orange County project is under design, and the San Diego Repurification project has proceeded to 30% design, but is currently on hold due to unresolved policy and public perception issues.

I. East Valley Water Recycling Project

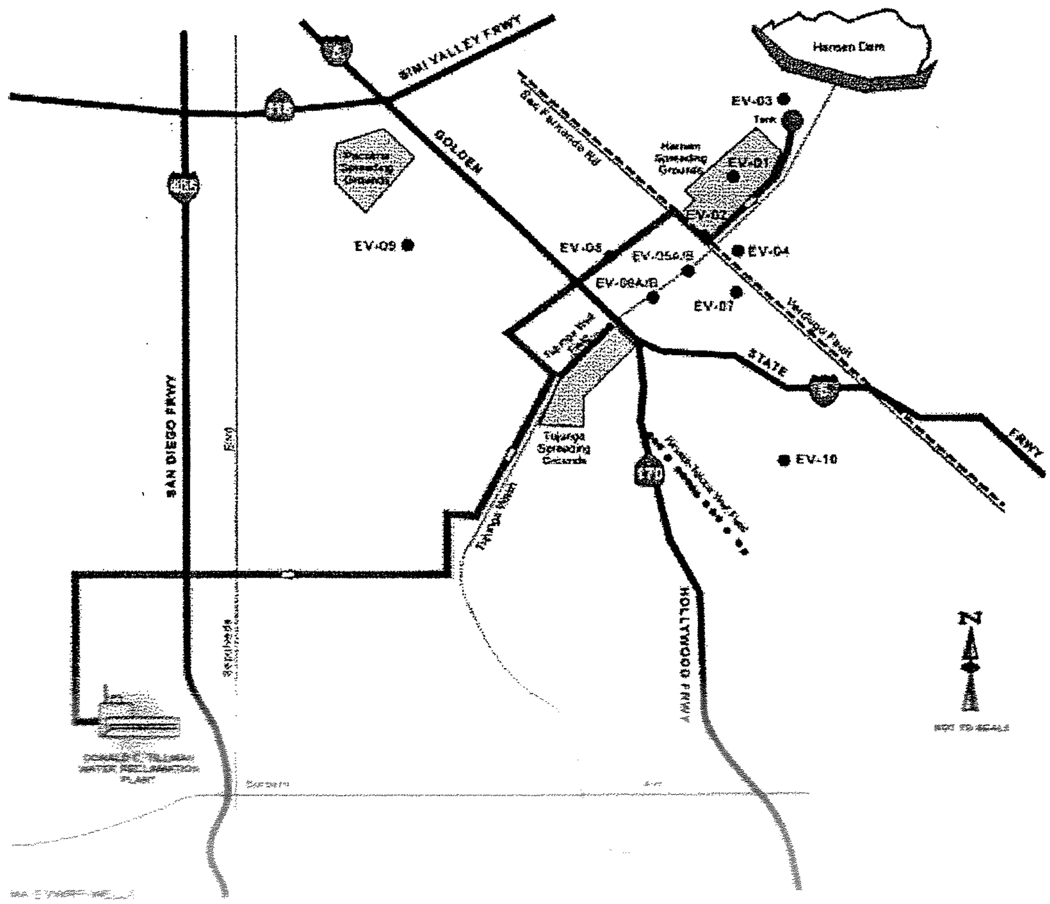
In June 1990, the Los Angeles City Council adopted a goal of reusing about 40% of the City's wastewater by 2010. In response to this goal, the City's Department of Water and Power (DWP) began development of the East Valley Water Recycling Project (EVWRP), which is the cornerstone water recycling project for the City. The EVWRP will ultimately provide up to 35,000 acre feet of recycled water per year for groundwater recharge at the Hansen and Pacoima Spreading Grounds in the San Fernando Valley, and for industrial and irrigation uses along the pipeline route. The EVWRP has received strong local, state, and national political support due to its regional and state importance.

Once completed, the EVWRP will lessen the City's demand on imported water supplies, and will replace a portion of the Mono Basin water no longer available for export. The EVWRP will also reduce the likelihood of severe water conservation measures in the future on residents and businesses in the event of a drought, as the overall reliability of the City's water supply will be improved.

Project Description

Phase IA of the EVWRP includes approximately ten miles of 54-inch diameter pipeline and a pumping station to deliver tertiary treated recycled water from the Donald C. Tillman Water Reclamation Plant to the Hansen Spreading Grounds. Phase IA of the EVWRP also includes an extensive monitoring well network designed to track the recycled water as it travels through the San Fernando Groundwater Basin from the spreading grounds to domestic production wells. Phase IA of the EVWRP will initially deliver up to 10,000 acre feet per year to the Hansen Spreading Grounds. Phase IB of the EVWRP will include construction of additional pipeline to deliver recycled water to the Pacoima Spreading Grounds. Phase II will include construction of additional facilities such as a tank and a booster pump station needed to deliver recycled water to irrigation and industrial customers.

FIGURE 1: EAST VALLEY WATER RECYCLING PROJECT



DWP is the lead agency for the EVWRP. The City's Bureau of Sanitation (Sanitation) and Los Angeles County Department of Public Works (Los Angeles County) have participated in the development of the EVWRP and are identified as responsible parties in the permit for operation of the project. Sanitation owns and operates the Donald C. Tillman Water Reclamation Plant which is the source of the recycled water for the EVWRP. Los Angeles County owns and operates the Hansen and Pacoima Spreading Grounds and will spread recycled water delivered by the EVWRP.

DWP staff worked closely with staff from the Regional Water Quality Control Board (Regional Board) and the State Department of Health Services (Health Department) to evaluate the EVWRP and develop appropriate operational and monitoring criteria. After review of the Groundwater Recharge Engineering Report by the Regional Board and the Health Department, Water Reclamation Requirements (permit) were issued on September 18, 1995. This permit allows for groundwater recharge of up to 10,000 acre feet per year at the Hansen Spreading Grounds for a three-year demonstration period. Groundwater modeling results, as well as the geologic and hydrogeologic features in the groundwater basin, indicate that this project is very conservative when evaluated using the proposed regulations for groundwater recharge upon which the approval for the EVWRP was based. An extensive groundwater monitoring and modeling program will track actual changes in water quality and recycled water movement within the groundwater basin, which will provide data for determining appropriate future project operations. The monitoring well system will also provide additional safeguards to the water supply by serving as an early warning system.

Economics

Phase IA of the EVWRP, which is scheduled to begin operation in 1999, has cost approximately $52-million. Up to 25% of this cost is being funded by the federal government through the Federal Reclamation Projects Authorization and Adjustment Act of 1992. Up to 50% of the total cost is being funded by the State of California through the Environmental Water Act of 1989. The remaining 25% of the total cost is being funded by ratepayers through special conservation and reclamation rate adjustments.

ESTIMATED CAPITAL AND OPERATION AND MAINTENANCE COSTS FOR PHAS IA

Without federal and state reimbursement

Capital Costs	$52,000,000
Amortized annual cost (6% interest for 30 years)	$3,777,743

Operation & Maintenance cost per acre-foot (AF)	$100
Annual delivery	10,000 AF
Cost of delivered water	**$478 per acre-foot**

With 25% federal and 50% state reimbursement

Capital Costs	$52,000,000
State Reimbursement (50%)	$26,000,000
Federal Reimbursement (25%)	$13,000,000
Net DWP capital expenditure	$13,000,000
Amortized net capital expenditure (6% interest for 30 years)	$944,436
Operation & Maintenance cost per acre-foot (AF)	$100
Annual delivery	10,000 AF
Cost of delivered water	**$194 per acre-foot**

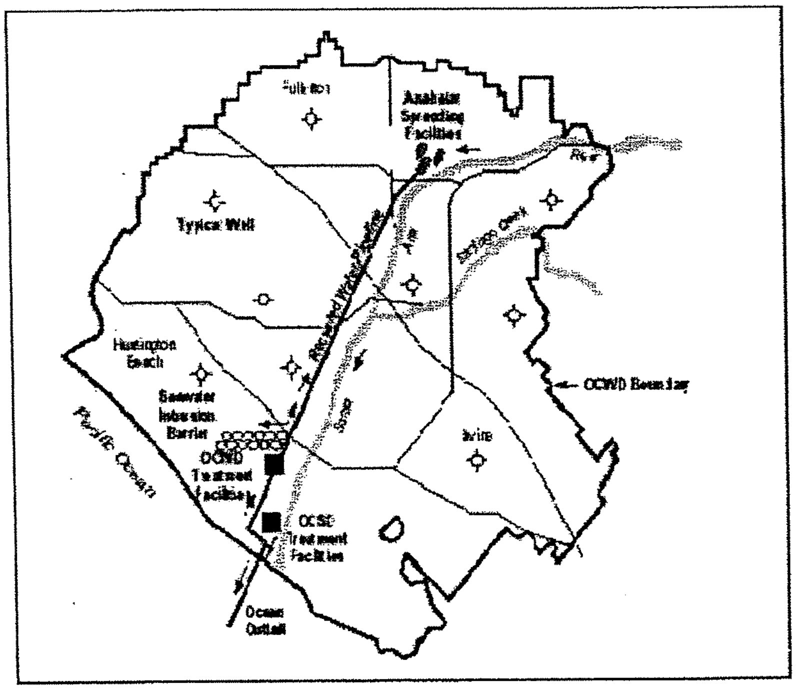
Phase IA of the EVWRP will provide water at an estimated cost of approximately $478 per acre-foot, with a net cost to DWP of approximately $194 per acre-foot when state and federal funding is considered. Even if state or federal funding had not been available, the EVWRP would still provide a new reliable source of water at a cost comparable to other water supplies, and significantly less expensive than other new supply options. According to the City Of Los Angeles Department of Water and Power Urban Water Management Plan Fiscal Year 1997-1998 Annual Update, seawater might be desalinated using new technology which has produced desalted ocean water at a cost of about $800 per acre-foot in pilot tests, or approximately $2000 using current technology. Furthermore, the EVWRP has other benefits which have not been quantified such as the reduction of water imported from the Mono Basin, and improved water system reliability resulting from a new local supply of water.

II. Groundwater Replenishment System

The Groundwater Replenishment System is being developed jointly by the Orange County Water District (OCWD) and the Orange County Sanitation District

(OCSD). After five years of planning and analysis, the Groundwater Replenishment System was determined to be the most economical and feasible new water supply for the region.

With OCSD secondary treated effluent as its source, the Groundwater Replenishment System would provide additional treatment including reverse osmosis and ultraviolet disinfection. The advanced treated recycled water would then be pumped to either: 1) existing spreading basins where it would percolate into and replenish the groundwater supply or 2) a series of injection wells that act as a seawater intrusion control barrier. The Groundwater Replenishment System would be implemented in three phases, providing roughly 68,000 afy of new water by the year 2003, 95,000 afy by 2010, and up to 120,000 afy by 2020.



Capital and Operation and Maintenance Costs

The cost of the water produced by the Groundwater Replenishment System is dependent on many factors including regulatory permit requirements, equipment and construction costs, power costs, operation and maintenance costs, system on-line reliability requirements, interest rates, and grants received from outside agencies. The following is a conservative preliminary estimate of the costs for the most probable alternative for Phase I of the Groundwater Replenishment System.

Capital Costs	$267 Million

Operation & Maintenance	$17.3 Million/year
Grant Receipts	$25 Million
Interest	6% amortized over 25 years
Power Cost	$0.06/kwh
Capacity Utilization	100% Barrier; 82% Spreading
Cost of Product Water	**$565/AF**

The utilization factor – the percentage of time that the system produces recycled water – significantly affects product water cost. It is anticipated that recycled water would be produced continuously for both the barrier and the spreading basins, with the exception of approximately 70 days during the winter months when the basins may not be able to accept water due to peak storm flows.

The estimated annual cost of the Phase I Groundwater Replenishment System, including capital amortization, operation, and maintenance totals approximately $38.2 million per year.

Value of Project Benefits

An explanation of project benefits and their economic values (avoided costs) are described below.

1. ***Alternative Water Supply***

If the Groundwater Replenishment System is not implemented, one of a variety of alternatives would need to be implemented to make up the anticipated water supply shortfall. OCWD conducted an analysis of three alternatives to meet the Groundwater Replenishment System production capacity. Each alternative would rely on continued imported water availability at non-interruptible rates, and two of the three alternatives would include some level of expansion or modification of Water Factory 21, OCWD's existing advanced recycled water treatment system. Based on the analysis, the following alternative represents the least-cost alternative to the Groundwater Replenishment Project.

Water Factory 21 would be expanded to provide all the water needed for seawater intrusion control via groundwater injection. Additional water needed for spreading would be purchased from the Metropolitan Water District of Southern California (MWD) and would require the construction of a pipeline from MWD's Diemer by-pass pipeline to the spreading facilities located in Anaheim. OCWD would avoid $ 27.4 million in annual costs, including expansion of existing treatment facilities, reduction in operation and maintenance costs, pipeline construction, and imported water costs, by implementing the Groundwater Replenishment System instead of this alternative water supply. Provided that imported water is available, the equivalent unit cost to implement this alternative would be $695/AF.

2. ***Salinity Management***

The Groundwater Replenishment System service area receives water from the Santa Ana River and imported water from the Colorado River Aqueduct and the State Water Project. The first two of these sources have relatively high salinity levels, potentially causing both agricultural and urban customers economic impacts. Agricultural water users suffer economic damage through reduced crop yields, added irrigation labor management costs, and added drainage requirements. Urban customers may incur additional costs due to more frequent replacement of plumbing and water using appliances. Estimated normalized costs for these replacements range from $100 to $150 per household each year.

The reverse osmosis-treated product from the Groundwater Replenishment System would lower the overall TDS content of the groundwater basin by at least 12.5 percent, saving the average household approximately $12.50 per year (or $25/AF). Industries and other large water users also could realize significant savings. With an average projected water use of approximately 675,000 AFY over the next 25 years, this provides an annual benefit of $16.9 million.

3. ***Reliability***

Allocations from imported water supplies are already overextended. Drought worsens the situation. And the population in north and central Orange County is increasing. It is currently projected that approximately 186,000 AFY of additional water would be required by the year 2020 to satisfy OCWD's service area demands.

The water supplied from the Groundwater Replenishment System would be available during times of drought, relieving the region of its dependence on imported water supplies. In addition, the Groundwater Replenishment System would protect the existing groundwater from further seawater intrusion and contamination. The value of this benefit is dependent on both drought frequency as well as other factors and is difficult to assess. No attempt to quantify the value of this benefit has been made.

4. ***Delay/Avoid Ocean Outfall Construction***

Implementation of the Groundwater Replenishment System would divert up to 100 million gallons per day (mgd) during Phase I from the Sanitation Districts Ocean Outfall Disposal System. During peak wet weather events, peak discharges of about 750 mgd are projected while the ocean disposal system capacity is approximately 480 mgd. To make up for this shortfall, OCSD is considering a variety of options including use of existing standby disposal facilities, retarding flows (peak shaving), and inflow reduction techniques to delay the near term cost of constructing a second ocean outfall. The most significant and economical way to reduce the peak is the diversion of 100 mgd through the Groundwater Replenishment System.

The estimated $150 million cost of a new ocean outfall can be delayed at least ten years by application of several peak reduction methods including this project. Assuming that half of this delay is due to the Groundwater Replenishment System (5 years) the savings at 6% interest spread over 25 years yields a $5 million per year benefit.

5. ***Section 301 (h) Waiver***

OCSD currently has a waiver under Section 301 (h) of the Clean Water Act from the requirement to discharge strictly secondary treated effluent thanks to a comprehensive source control program (in the wastewater collection system) and the relatively good quality of their effluent. OCSD's waiver is the largest granted by the United States Environmental Protection Agency (EPA) and in 1989 was estimated to save over $50 million per year in capital, operation, and maintenance costs. Protection of this waiver is OCSD's highest priority, and commitment to water reclamation could complement future waiver requests. However, the degree to which waiver savings can be attributed to the Groundwater Replenishment System is difficult to assess. If for example, the Groundwater Replenishment System accounted for 20% of the savings, the project could be credited with $10 million per year in cost avoidance. However, no credit was taken for this project benefit.

6. ***Revised Discharge Permit***

OCSD's 1998 ocean discharge permit allows a discharge of 20,000 metric tons per year of suspended solids and, thanks to a condition in the permit, would be re-opened if the Groundwater Replenishment System were built. The Regional Water Quality Control board could then consider an increase in solids loading discharge to 25,000 metric tons per year, potentially delaying construction of new secondary facilities (10 years). The savings in operation and maintenance (including solids disposal), amortized at 6% interest over 25 years, is $9.9 million per year. However, these savings were not included in the evaluation of this project.

Economic Summary

The annual cost to implement the Groundwater Replenishment System including capital, operation and maintenance, engineering, administration, and contingencies, at 6% interest and amortized over a 25-year period, would be approximately $38.2 million. Totaling the avoided costs presented above, including Alternative 2 as the next lowest cost water supply solution, the total annual benefits are as follows:

Item	Total Annual Cost Avoidance (Millions $)
OCWD Cost Avoidance	$27.4
Salinity Management	$16.9
Reliability	Not Counted
OCSD, Delay in outfall	$4.9
OCSD, Waiver Support	Not Counted
OCSD, Secondary Savings	Not Counted
TOTAL BENEFITS	**$49.2**

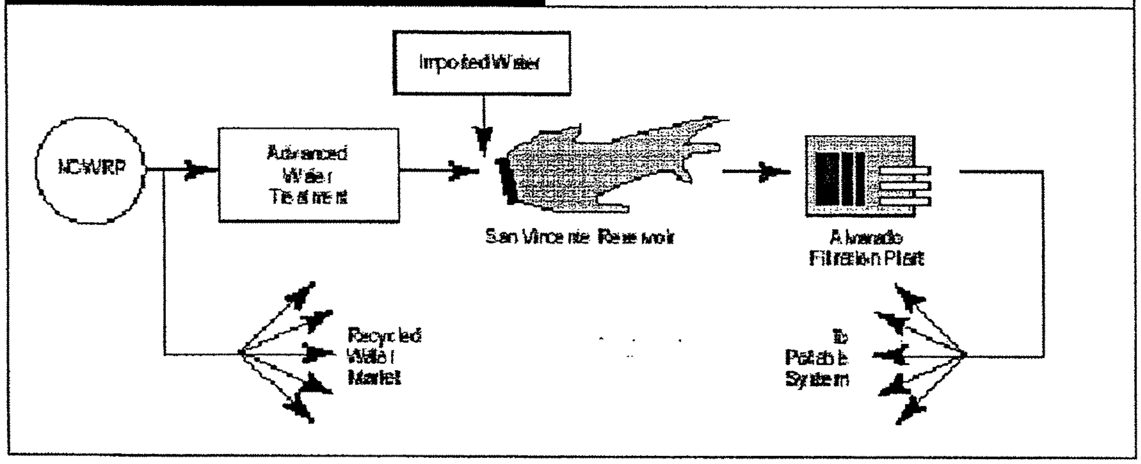
This results in a maximum Benefit to Cost Ratio of 1.288 ($49.2/$38.2), not including estimates for reliability, waiver support, and secondary treatment savings. Based on this analysis, OCWD and OCSD have decided to move forward with the implementation of this project.

III. San Diego Water Repurification Project

The City of San Diego, in conjunction with the San Diego County Water Authority (SDCWA), the Metropolitan Water District of Southern California (MWD), and the U.S. Bureau of Reclamation, has proposed a surface water augmentation project to achieve indirect potable reuse of reclaimed water from the City's North City Water Reclamation Plant (NCWRP). The Water Repurification Project would provide a renewable, reliable, local source of raw water that would expand the City's total available raw water supply under its direct control. In a region in which 90% of its water supply is imported from the Colorado River and northern California, this project is not only resource-efficient, but it also improves the cost-effectiveness of the NCWRP.

The proposed project, designed to produce between 15-20,000 AFY of repurified water, consists of a 20 million gallon per day (MGD) advanced water treatment plant (co-located with the NCWRP) and a 23-mile pipeline to deliver the repurified water to the City's San Vicente water supply reservoir in eastern San Diego County. The advanced treatment plant (AWTP) would treat tertiary effluent from the NCWRP using a treatment process train including microfiltration, reverse osmosis, ion exchange, and ozonation. The repurified water would be introduced into San Vicente Reservoir, where it would blend with imported water. Raw water from San Vicente Reservoir would be pumped to the Alvarado Filtration Plant prior to being introduced into San Diego's potable water distribution system.

San Diego Repurification Schematic



The City has been conducting research into the advanced treatment and ultimate use of repurified water as a supplement to potable supplies since the early 1980's. Since 1993, the City has worked closely with the California Department of Health Services (DHS) to develop a project that meets the department's strict standards for public health and reliability, while maintaining its cost-effectiveness. DHS has approved the project for design, which commenced in early 1997 but was put on hold in late 1998 due to policy and public perception issues.

Capital and Operation and Maintenance Costs

The following is a preliminary estimate of the costs for the San Diego Water Repurification project.

Capital Costs	$168 Million
Operation & Maintenance	$4.1 Million/year
Interest	5.75% amortized over 30 years
Power Cost	$0.05/kwh
Capacity Utilization	83%
Gross Cost of Product Water	$1060/AF

Title IX Funding	($38/AF)
SRF Loan (0%, 30 yrs)	($94/AF)
MWDSC Incentive	($250/AF)
SDCWA Incentive	($100/AF)
Cost of Product Water	**$578/AF**

The above unit cost is based on 1) estimated repurified water production of 15,000 AFY, grant funding of $8 million, and a State Revolving Fund $50 million zero interest loan, with $7 million (13%) contributed by City.

Value of Project Benefits

An explanation of project benefits and their economic values are described below.

1. ***Alternative Recycled Water Supply***

The City and the SDCWA have committed to incorporating water recycling into the water supply mix. At a production capacity of 30,000 AFY, NCWRP is the largest water recycling plant in the region, and provides the best opportunity for large-scale reuse. A recycled water distribution system currently serves roughly 5,000 AFY of NCWRP product to local non potable customers. If the water repurification project is not built, the City would expand the non potable distribution system to serve an additional 5,900 AFY.

The value of the Water Repurification project includes the avoidance of construction and operation of this expanded distribution system. The estimated capital cost of this distribution system expansion is $83 million. Estimated annual operations and maintenance costs to distribute the additional 5,900 AFY are $450,000.

2. ***Additional Avoided Wastewater Costs***

Wastewater flows that are not treated at NCWRP and beneficially reused must be conveyed to the Point Loma Wastewater Treatment Plant. These unused flows would cause increased operation of the City's collection system Pump Station No. 2, and would undergo re-treatment at the Point Loma plant. The City has estimated that annual operations and maintenance costs associated with accommodating this 5,900 AFY are $236,000 at Pump Station No. 2 and $855,000 at Point Loma.

Economic Summary

The City commissioned an independent study of the cost-effectiveness of the Water Repurification project. Considering the estimated construction and operations and maintenance costs of the project, and considering the avoided costs as discussed above, San Diego expects this project to fully recover 100% of its capital costs, debt service and operation and maintenance costs within fifteen years after it commences operations.

CONCLUSIONS

Recycled water represents a safe and reliable new water supply that provides insurance against future droughts or shortages of imported water supplies, and provides a stable foundation for maintaining and improving California's economic prosperity and quality of life.

The East Valley Water Recycling Project, Groundwater Replenishment System, and San Diego Water Repurification Project exemplify how indirect potable reuse projects, when compared to other water supply and wastewater management options, can offer the greatest benefits for the least cost. The ultimate success of these projects would be attributable to project sponsors reaching out and forming alliances with the full array of beneficiaries. Public involvement and education also would be instrumental in successful project development.

ACTON BOARD OF HEALTH

Douglas Halley
Health Director

472 Main Street
Acton, MA 01720

Telephone 978-264-9634
Fax 978-264-9630

Town of Acton
Comprehensive Water Resources Management Plan
Citizens Advisory Committee
Indirect Potable Reuse Working Group

Meeting #5
10/25/2005
Acton Town Hall
Room 126

Call to Order 730pm

I. Introductions

II. Discussion of Draft Final Report

Adjourn by 900pm

INDIRECT POTABLE REUSE WORKING GROUP

Acton Board of Health - Telephone (978) 264-9634

FINAL REPORT

OF THE

ACTON INDIRECT POTABLE REUSE

WORKING GROUP

NOVEMBER 15, 2005

Background

The Acton Indirect Potable Reuse Working Group was formed in May, 2005, as a sub-group of the Citizens Advisory Committee (CAC) for the Comprehensive Water Resources Management Plan (CWRMP). The Group was tasked with the evaluation of the concept of Indirect Potable Reuse, prior to any consideration of its implementation within Acton. The Group performed its duties under the following mission statement:

> "To evaluate the potential feasibility of the implementation of Indirect Potable Reuse of highly treated Wastewater Treatment Plant effluent through a discharge to a wellfield; the group will examine the issue from the "human" perspective, looking at the political and public relations impacts of any proposal. Those impacts can then be used to determine whether this concept is feasible as a discharge option within Acton."

The Group members are:

Art Gagne' –	Member of the CAC
Eric Hilfer –	ACES representative and member of the CAC
Joanne Bissetta –	Member of the Acton Board of Health
Greta Eckhardt –	Acton Resident
Pat Cumings –	Member of the CAC

Observers who attended meetings:

Dr. Peter Shanahan –	MIT Professor and Co-Founder of Hydroanalysis Inc.
James Gagliard –	Acton Wastewater Treatment Facility Manager
Mary Michelman –	President of Acton Citizens for Environmental Safety (ACES)

Indirect Potable Reuse – The Concept

Indirect Potable Reuse, which is groundwater recharge via surface or subsurface disposal in order to augment a potable aquifer, has been in practice across the United States for many years in both planned and unplanned fashions. In Massachusetts, according to the Reclaimed Water regulations now under review, Indirect Potable Reuse would be defined as a discharge of highly treated wastewater treatment plant effluent into an aquifer, with no less than a one year travel time from the point of discharge to the point of intake of the well(s).

Indirect Potable Reuse is only one facet of the larger concept of reclaimed water use. This holistic approach to preservation of the local hydrologic cycle includes reuse options for irrigation – residential, commercial, and agricultural; industrial cooling systems; process water in manufacturing facilities; toilet flushing; snowmaking; and fire protection systems. As greater awareness is achieved in regards to the growing scarcity of water resources, water reclamation practices, like Indirect Potable Reuse, are growing in popularity.

Acton CWRMP

The Acton Comprehensive Water Resources Management Plan (CWRMP) was undertaken as part of the acceptance of the Middle Fort Pond Brook Sewer Project by the Massachusetts Department of Environmental Protection (DEP); to determine the wastewater disposal needs for the entire Town, along with the integrated planning necessary to protect Acton's vital liquid resources for the next 20 years.

The CWRMP is guided by two groups working jointly to develop a cohesive plan. The Project Team – consisting of Acton Health Department staff and Woodard and Curran, Inc. engineers and scientists; and the Citizens Advisory Committee – a group of local stakeholders appointed by the Acton Board of Selectmen to represent the broadest possible range of views in regards to Acton's water resources.

As part of the project, wastewater disposal options were evaluated for centralized and decentralized sewer projects of varying sizes. As Acton is both regulatorily and environmentally limited for surface discharge locations, subsurface discharge must be the primary option examined. Subsurface disposal of treated wastewater requires soils with high permeability in order to efficiently dispose of the effluent from both a cost and footprint perspective. As Acton is solely reliant on groundwater aquifers for its public water supply and those aquifers are located in the most permeable soils, the concept of Indirect Potable Reuse was a concept that could not be ignored as a part of a 20 year water resources management plan.

Indirect Potable Reuse Working Group

A sub-group of the Citizens Advisory Committee was formed in May of 2005 to further examine the issues surrounding Indirect Potable Reuse. As explained earlier, the group was established to represent important viewpoints, and to also solicit comment from stakeholders who had positive, negative, and non-existent opinions on the concept.

The group received information packets, consisting of published educational journal articles, copies of government-produced information, and newspaper articles all directly related to Indirect Potable Reuse. Copies of these packets are included in Appendix A of this report. The group met throughout the summer of 2005, to discuss the issues related to Indirect Potable Reuse in accordance with the group's mission statement.

Discussion

After a thorough review of the academic and professional research presented, the group delineated four major areas of concern, each containing topics requiring further research.

These four major areas of concern are:

1) Detection and removal of multiple classes of emerging contaminants
2) Timing of implementation in regards to technological, regulatory, and political timelines
3) Comparison of centralized Indirect Potable Reuse in one wellfield versus decentralized Indirect Potable Reuse in multiple wellfields
4) Coupling implementation with increased water conservation and emerging contaminant source reduction efforts

Detection and removal of multiple classes of emerging contaminants

Current research by multiple educational and governmental institutions have identified new classes of emerging contaminants in wastewaters, drinking waters, groundwaters, and surface waters. While research into the possible health effects of these categories of contaminants is ongoing, the absence of concrete toxicological and medical data cannot be ignored. These new classes of contaminants include pharmaceuticals, personal care products, their metabolites and their by-products.

Studies in Europe, Australia, and the United States are in varying stages of completion in regards to the prevalence of these compounds in wastewater treatment plant influent and effluent. The Town of Acton is participating in one of these studies, sponsored by the Johns Hopkins Bloomberg School of Public Health. This study will report the prevalence and concentration of many of the most common classes of these emerging contaminants, allowing the Town to develop a baseline against which to measure future treatment and disposal options. Separate studies are evaluating the capacity of different wastewater treatment technologies and processes to reduce or eliminate these compounds from the waste stream. Initial results of both sets of studies are presented in some of the articles attached to this report in Appendix A.

Timing of implementation in regards to technological, regulatory, and political timelines

If the Town chooses to further consider Indirect Potable Reuse as a reclaimed water practice, it will be impacted by the progression of the acceptance of this practice on a local, regional, and national scale.

At the local level, a significant public participation and education campaign must be successfully mounted, and this campaign should be spearheaded by an elected or appointed Town official, not a staff member. It is important that the residents of Acton sufficiently understand the concept of Indirect Potable Reuse so that they may both collectively and individually accept or reject the proposal. This local acceptance must also fit into the Town's broader water resources management strategy in regards to the treatment and disposal capacity necessary to provide a solution to the designated needs areas.

Developments on the regulatory front may have the greatest impact on the possibilities for implementation of Indirect Potable Reuse in Acton. The Commonwealth of Massachusetts is currently developing a new set of Reclaimed Water Regulations, which will govern the reuse of highly treated wastewater in a variety of modalities. Indirect Potable Reuse will, of course, be included as a component of these regulations. These regulations will govern the effluent quality required for an Indirect Potable Reuse discharge, and the economic implications of the level of treatment may be the ultimate determining factor in implementation.

From a technological standpoint, the field of wastewater treatment advances each day in its ability to reduce various compounds to increasingly lower concentrations in treatment plant effluent for reuse projects. While it is impossible to predict what effluent limitations would be placed on any proposed Indirect Potable Reuse project in Acton sometime in the future, it can be expected that proven technologies will be available to meet those limits. The current wastewater treatment plant on Adams Street is discharging potable water according to EPA/FHA primary and secondary standards, and a grab sample collected from the effluent channel. A caveat to this section would be the inclusion of any classes of emerging contaminants in effluent limitations. As stated previously, studies are still underway to determine which treatment process will most efficiently remove which classes of compounds. Further study would be required, possibly at the local level, in order to determine the best course of action in this case.

Comparison of centralized Indirect Potable Reuse in one wellfield versus decentralized Indirect Potable Reuse in multiple wellfields

The Town of Acton receives 95% of its drinking water from the five Acton Water District wellfields located across the community (see figure 1). As the implementation of Indirect Potable Reuse is evaluated against the needs areas identified in the Comprehensive Water Resources Management Plan, the possibility of lesser discharges spread across multiple wellfields should also be considered. This could allow for broader basin-wide recharge, which could be a benefit to stream flow; and it could also allow for greater proliferation of offsite wastewater disposal solutions for needs areas from north to south Acton.

Coupling implementation with increased water conservation and emerging contaminant source reduction efforts

The implementation of an Indirect Potable Reuse project in Acton, and the public participation and education campaign that will proceed such a project, will offer a unique outreach opportunity for the Town and the Water District to further encourage conservation, and to discourage the waterborne disposal or decrease in usage of those products which, along with their metabolites and by-products, make up the classes of emerging contaminants mentioned previously.

Recommendations

Indirect Potable Reuse is a concept which may serve a purpose in the future water resources management efforts in the Town of Acton. Through its work, the group determined that four major areas of concern existed, and under each of those areas, many questions still remain unanswered. Those four areas are, again:

1) Detection and removal of multiple classes of emerging contaminants
2) Timing of implementation in regards to technological, regulatory, and political timelines
3) Comparison of centralized Indirect Potable Reuse in one wellfield versus decentralized Indirect Potable Reuse in multiple wellfields
4) Coupling implementation with increased water conservation and emerging contaminant source reduction efforts

As the Town completes the Comprehensive Water Resources Plan development process and moves forward with bringing wastewater management solutions to needs areas, no concept, including Indirect Potable Reuse, should be discarded prior to an intensive, citizen-driven, review process.

Should the Town choose to further explore implementation of Indirect Potable Reuse, a permanent committee, similar to the Sewer Action Committee, should be appointed by the Board of Selectmen to further evaluate implementation options. This committee should be chaired by an elected or appointed town official who is also a resident of the community. It should include representation from, at least, the following stakeholders:

- Acton Board of Health
- Acton Citizens for Environmental Safety
- Acton Planning Board
- Acton Water District
- Acton Conservation Commission
- The current incarnation of the Wastewater Citizens Advisory Committee
- Residents from those areas who will benefit from the additional disposal capacity
- Acton residents-at-large

This committee should work with the Town's consultants to cultivate a public participation and education plan devoted to Indirect Potable Reuse, and if the response is positive, should work to bring the project to fruition.

Indirect Potable Reuse, as a concept, holds much promise, not only for the Town of Acton, but for many other communities across New England, as the true nature of the scarcity of our liquid reserves becomes readily apparent.

INDIRECT POTABLE REUSE WORKING GROUP

Acton Board of Health - Telephone (978) 264-9634

Meeting Minutes

6/1/2005 Meeting
Room 126
Acton Town Hall

Attendees: *Brent Reagor, Acton Health Department (BR)
Jim Gagliard, Woodard and Curran (JG)
*Greta Eckhardt, Acton Resident, AWD Land-Water Use Committee (GE)
*Eric Hilfer, Acton Resident, ACES, CAC (EH)
Mary Michelman, Acton Resident, ACES (MM)
Peter Shanahan, Acton Resident (PS)
*Art Gagne, Acton Resident, CAC (AG)

*IPR Working Group Member

**With Attachments

The meeting was called to order at 7:15pm

BR introduced the IPR group, the mission statement, and a short synopsis of what is expected of the group by the CAC. He explained that the need for a disposal site for highly treated wastewater treatment plant effluent is the driving factor in the formation of this group.

The members of the group and guests introduced themselves.

The group discussed why the concept of Indirect Potable Reuse is emerging in New England, based upon local and regional hydrologic losses, encouragement from EOEA through the Massachusetts Water Policy, and advocacy from organizations like the New England Water Environment Association.

BR explained the group was seated to discuss this issue as a stakeholder input group, and the group is expected to give a written report to the CAC at their October meeting with one of three answers, along with justification for the answer:

1) Yes, Acton should pursue this concept
2) No, Acton should not pursue this concept
3) This concept is promising for Acton but additional questions must be answered

BR introduced 2 other members, Joanne Bissetta and Pat Cumings, who could not attend the meeting.

GE asked about the current status of regulations regarding reuse in Massachusetts based upon what she had read in the 2004 EPA Reuse Guidelines sections sent to the group. BR explained that MA currently uses a set of "Reclaimed Water Use Standards" set forth in a DEP policy document, and that the state is currently seating a committee to write a set of water reuse regulations.

MM asked is drinking water standards or wastewater standards are applied to effluent discharges in reuse situations. BR explained that drinking water standards are applied in these cases as the DEP develops the permitted limits of various constituents of effluent on a case-by-case basis.

MM and GE expressed concern regarding trace organic chemicals, pharmaceutical by-products, estrogen mimics in effluent. BR explained this is the major emerging issue and the Town is part of a nationwide surveillance study for these compounds being conducted by the Johns Hopkins School of Public Health and will be sampling at the wastewater treatment facility for a broad range of those compounds. PS explained that the USGS and other institutions have done surveillance studies in both surface waters and drinking water supplies and have found part-per trillion levels of some of these compounds in places like Atlanta and the lower Mississippi River basin.

PS explained that these emerging compounds exist currently in most areas of the country and we are just unaware because of the previous inability to analyze water specifically for these compounds.

MM asked about concentration of effluent on wellfields versus a broad distribution of onsite systems. BR, AG, and PS explained that onsite wastewater systems do not achieve levels of treatment anywhere near those of modern wastewater treatment facilities like Acton. GE brought up the inability of control over what people flush down the drain, BR mentioned that in a sewer system this can be somewhat controlled with dilution, and the ability to halt a discharge if harmful contaminants are found.

MM asked about local hydrologic loss within the Fort Pond Brook and Nashoba Brook associated with an IPR discharge at the High Street wellfields. PS stated that an IPR discharge with a shortened travel time from discharge point to well intake could actually benefit the local streams as withdrawals will not have as great as an impact. MM stated she would like to see this topic explored not only at Adams Street, but would rather see a distributed approach. The group continued to discuss the current status of Zone II discharges from both small package treatment facilities and onsite systems across Acton and the current impact of those systems on our wells.

BR stated that this group has also drawn much interest from both the public and private sectors and the group may have some observers or other participants from time to time.

AG and EH asked about the current treatment levels at the WWTF versus what they may have to be in order to achieve IPR. EH spoke about the Denver study mentioned in the EPA Reuse Guidelines on efficacy of treatment processes related to the removal of emerging contaminants. BR stated this is a major research issue now as a multitude of treatment technologies must be tested.

GE spoke about source reduction of contaminants and flow through conservation efforts and public education programs. The group shared favorable opinions on this subject and spoke about the research conducted into wastewater flows by the Health Department.

The group agreed that four major topic areas need to be discussed. In order of importance, they are:

1) Emerging contaminants – detection and removal
2) The timing of the implementation of the project and coincidence with regulatory, treatment technology, and political timelines
3) Source reduction efforts for water use and pollutant removal
4) Centralized IPR versus Decentralized IPR

The group agreed to meet approximately once every three weeks, with the coordination to come from BR. One of the next meetings will be held at the Acton WWTF.

BR thanked the members and guests for attending and stated the next meeting date will be sent out shortly.

The meeting adjourned at 845pm

Respectfully Submitted,

Brent L. Reagor

INDIRECT POTABLE REUSE WORKING GROUP

Acton Board of Health - Telephone (978) 264-9634

Meeting Minutes

6/30/2005 Meeting
Room 126
Acton Town Hall

Attendees: *Brent Reagor, Acton Health Department (BR)
*Greta Eckhardt, Acton Resident, AWD Land-Water Use Committee (GE)
*Eric Hilfer, Acton Resident, ACES, CAC (EH)
*Art Gagne, Acton Resident, CAC (AG)
*Joanne Bissetta, Acton Resident, BOH (JB)
Mary Michelman, Acton Resident, ACES (MM)

*IPR Working Group Member

The meeting was called to order at 7:32pm

The group reviewed the minutes from the previous meeting. Minor changes were made to the discussion on reuse and its impact on local hydrologic loss, along with a change in phrasing for one of the three possible answers the group may issue in its final report.

Discussion of the minutes spurred discussion of the title of the group. MM states we should change the title, AG and GE both stated that the most important title was the title of the final report. AG stated that if people do not understand what the title means, one of the hurdles we must overcome is education about the definition of indirect potable reuse.

The group discussed the issue of local hydrologic impacts related to a centralized IPR discharge. MM stated she would like to see more about this issue, but stated that an IPR discharge at the High Street wellfields may have a beneficial impact of mounding the groundwater and creating a hydrologic gradient, thereby preventing significant intrusion of contaminant plumes.

BR updated the group about the Johns Hopkins School of Public Health (JHSPH) study. The samples had been sent to Baltimore for analysis. He has also been asked to join the statewide Task Force that has been seated to author Water Reuse regulations for the Commonwealth. He also stated that the Metropolitan Area Planning Council (MAPC) is looking at all forms of water reuse, including greywater, stormwater, and wastewater along the lines of the Massachusetts Water Policy, and that MADEP is in the process of hiring a Watershed Outreach Coordinator to encourage reuse.

The group began a discussion of the four articles sent out with the packets. BR gave a short introduction of each article. GE stated she was surprised by two things: 1) the prevalence of caffeine, and the fact that the USGS study had positive results in every sample analyzed. AG stated that he believes the discovery of emerging contaminants in effluent will always be a continuum as new analytical methods are developed and new compounds are created. MM stated there is a lag time between production of new compounds and development of revised analytical methods and the presence of no data does not mean it is not harmful.

AG stated that the group is not conversant in the topics discussed in the scientific articles. EH stated the results from the JHSPH study will be of some help. AG would like to see more fact sheets and FAQ documents. GE would like to see guiding questions or points to consider sent out with the articles, prior to the meetings. BR agreed to do this for the current articles and any future research.

GE asked what would be considered the major classes of emerging compounds would be. BR stated, as he sees it, they are: Endocrine disruptors/mimics, Pharmaceutical compounds and their metabolites and by-products, and Personal care products and their by-products. However, compounds may be members of more than one class. AG stated that medicine disposal practices (i.e. flushing unused medications) may lead to detection of these contaminants at higher levels. BR stated that the State of Maine has developed a public relations campaign to discourage people from flushing unused medications for just that reason.

MM stated she was intrigued about research into the effects of wastewater treatment processes on the compounds in question. BR stated he would make sure to include information on that in a future packet. AG cautioned that with the continuum of discovery in science, Acton should be careful not to develop the "guinea pig" mentality. GE asked about heavy metals and pesticides in WWTF effluent. BR stated that these must come from an industrial source, and there are no so such sources currently connected or planned to be connected to the sewer system.

The group settled on July 20 and August 18 as the next two meeting dates.

The meeting adjourned at 8:54pm.

Respectfully Submitted,

Brent L. Reagor

INDIRECT POTABLE REUSE WORKING GROUP

Acton Board of Health - Telephone (978) 264-9634

Meeting Minutes

7/20/2005 Meeting
Room 121
Acton Town Hall

Attendees: *Brent Reagor, Acton Health Department (BR)
*Greta Eckhardt, Acton Resident, AWD Land-Water Use Committee (GE)
*Joanne Bissetta, Acton Resident, BOH (JB)

*IPR Working Group Member

The meeting was called to order at 7:30pm

Due to minimal attendance, the group decided that this meeting would not be held.

The meeting adjourned at 7:35pm.

Respectfully Submitted,

Brent L. Reagor

INDIRECT POTABLE REUSE WORKING GROUP

Acton Board of Health - Telephone (978) 264-9634

Meeting Minutes

8/18/2005 Meeting
Conference Room
Acton Wastewater Treatment Plan

Attendees: *Brent Reagor, Acton Health Department (BR)
*Greta Eckhardt, Acton Resident, AWD Land-Water Use Committee (GE)
*Art Gagne, Acton Resident, CAC (AG)
*Joanne Bissetta, Acton Resident, BOH (JB)
*Pat Cumings, Acton Resident, CAC (PC)

*IPR Working Group Member

The meeting was called to order at 7:40pm

The group toured the Acton Wastewater Treatment Facility. During the tour, applications of reuse in relation to the design of the current treatment facility were discussed.

After the tour, BR updated the group on the first meeting of the Massachusetts Reclaimed Water Task Force and the status of the new reclaimed water regulations.

The meeting adjourned at 8:45pm.

Respectfully Submitted,

Brent L. Reagor

INDIRECT POTABLE REUSE WORKING GROUP

Acton Board of Health - Telephone (978) 264-9634

Meeting Minutes

10/25/2005 Meeting
Room 126
Acton Town Hall

Attendees: *Brent Reagor, Acton Health Department (BR)
*Greta Eckhardt, Acton Resident, AWD Land-Water Use Committee (GE)
*Art Gagne, Acton Resident, CAC (AG)
*Joanne Bissetta, Acton Resident, BOH (JB)
*Eric Hilfer, Acton Resident, ACES (EH)
Mary Michelman, Acton Resident, ACES (MM)

*IPR Working Group Member

The meeting was called to order at 7:30pm

BR began by thanking the group for all their hard work throughout the past few months and requested that the review of the final report proceed sequentially through each section.

Multiple group members suggested the inclusion of a "Executive Summary" at the beginning of the report.

EH and GE asked about providing definitions for some of the technical water supply terms like travel time and Zone II.

AG suggested that the definitions be contained in footnotes.

MM suggested that Topic area #1: "Detection and removal of multiple classes of emerging contaminants" be expanded to include information about potential health effects.

GE and AG suggested that language be added to the discussion of Topic area #1 that quantifies that this process will always be a continuum of discovery.

Members of the group questioned who was meant by "The Town" throughout the document. It was explained that this was the citizens of Acton and elaboration would be included.

AG felt it was more important to stress the overall performance of the WWTF on Adams Street than information regarding one sample. This performance should be related to the drinking water standards set by EPA.

The group expressed its concern that the discussion of Topic #4 should be rephrased to be more of an "if…then" paragraph.

MM wanted the report to stress the importance of IPR as a method of wastewater disposal.

AG discussed the feasibility of a small-scale pilot program that would provide local answers to some of the important questions regarding the project.

The meeting adjourned at 9:10pm.

Respectfully Submitted,

Brent L. Reagor