

## MODELING TABLE 1

### Calculations and Assumptions Used to Scale up Data to the Town Level Based on Results from the Water Conservation Pilot Projects

The following information was compiled by the Massachusetts Department of Conservation and Recreation, in consultation with a Technical Advisory Committee of water conservation professionals, based on results of the pilot water conservation projects implemented under the Ipswich Targeted Watershed Grant. The unit savings observed from the pilot projects (shown below) were scaled up to the town level for communities with municipal water supplies in the Ipswich River Watershed, using the assumptions and formulas described below. These assumptions are intended to represent the widest possible adoption of each strategy that could reasonably be anticipated through regulatory and/or incentive programs.

Water-conservation pilot project	Description of per unit savings and assumptions used to scale results up to town level	Per unit savings based on water-conservation pilot projects (gallons/month)
800-gallon rainwater harvesting systems	<p>Average savings per participating single family household:</p> <p>Assumption that 1/3 of the single-family homes in all Ipswich towns participate</p> <p>Reduction in withdrawals at Ipswich water-supply sources = 433 gallons/month * 1/3 * number of single family homes * percent of water supply pumped from Ipswich sources</p>	433
Low-flow indoor fixtures and appliances	<p>Average savings per participating household:</p> <p>Assumption that participation rates in other Ipswich towns would resemble those observed in town with the pilot program (approximately 9%)</p> <p>Average savings per household town-wide:</p> <p>Reduction in withdrawals at Ipswich water-supply sources = 35 gallons/month * number of households * percent of water supply from Ipswich sources</p>	450  35
Soil amendments at athletic fields	<p>Average per-acre savings resulting from zeolite soil amendment:</p> <p>Assumption that all athletic fields are treated similarly to pilot-study field</p> <p>Reduction in withdrawals for all athletic fields currently irrigated by public water = 6,671 gallons/month * acreage * percent of water supply from Ipswich sources</p> <p>Reduction in withdrawals for all athletic fields irrigated by on-site wells within the Ipswich River Basin = 6,671 gallons/month * acreage<sup>1</sup></p>	6,671
Weather-sensitive irrigation systems on athletic fields	<p>Average per-acre savings resulting from weather-based irrigation systems:</p> <p>Assumption that all athletic fields irrigated were equipped with weather-sensitive irrigation systems</p> <p>Reduction in withdrawals for all athletic fields currently irrigated by public water = 21,128 gallons/month * acreage * percent of water supply from Ipswich sources</p> <p>Reduction in withdrawals for all athletic fields irrigated by on-site wells within the Ipswich River Basin = 21,128 gallons/month * acreage<sup>1</sup></p>	21,128

<sup>1</sup> For HSPF simulations, reductions in non-public groundwater supply sources were attributed to the public water supply sources in the same town.

## MODELING TABLE 2

### Town Statistics Used to Scale up Data to the Town Level Based on Results from the Water Conservation Pilot Projects

The formulas described in Modeling Table 1 were applied to the following information, compiled by the Massachusetts Department of Conservation and Recreation, in consultation with a Technical Advisory Committee of water conservation professionals and municipal representatives from each town with municipal water supplies in the Ipswich River Watershed.

Town	Number of single family detached homes	Total number of households	Percent of water supply from sources in the Ipswich River Basin	Total area of athletic fields irrigated with public water supplies (acres)	Total area of athletic fields irrigated with on- site wells located in the Ipswich River Basin (acres)
Wilmington	6,368	7,158	42 (summer only)	3.2	35
Danvers Water Supply					
Middleton*	1,719	2,347	100	3.3	1.8
Danvers	6,299	9,762	100	15	0
North Reading	4,029	4,870	40 (summer only)	0	14
Peabody	10,959	18,898	50	34	13
Hamilton	2,358	28,525	100	1.5	12
Ipswich	3,723	5,601	25	11	0
Topsfield*	1,842	2,144	100	2.8	11
Wenham	1,040	1,320	100		4.5
Salem Beverly Water Supply					
Salem	4,915	18,175	100	19	0
Beverly	8,450	16,275	100	23	0
Lynnfield	3,705	4,273	54	0	1
Lynn	11,673	34,690	20	22	0

\* 50-60 percent of Middleton residents and 15 percent of Topsfield residents use private wells, but all are located within the Ipswich River Basin. For Hydrological Simulation Program-FORTRAN simulations, the hypothetical savings at these private wells were attributed to the respective public water supply sources for each town.

### MODELING TABLE 3

## Hypothetical Water-Use Reductions Obtained by Scaling up the Results from the Water Conservation Pilot Projects

As part of the U.S. Geological Survey modeling conducted under the Ipswich Targeted Watershed Grant study, the water savings shown below were totaled for each town and distributed among the town's Ipswich basin water supply sources in proportion to the volume each source contributes to the town's overall supply, on average.

Town or supplier	Water-use reductions from installation of 800-gallon rainwater harvesting systems (summer) (gal/month)	Water-use reductions from installation of low-flow indoor fixtures and appliances (year round) (gal/month)	Water-use reductions from application of soil amendments at athletic fields (summer) (gal/month)	Water-use reductions from installation of weather-sensitive irrigation systems on athletic fields (summer) (gal/month)	Total water-use reductions (summer savings plus year-round savings) (gal/month)	Total water-use reductions (summer savings plus year-round savings) (ft <sup>3</sup> /s)	Average town withdrawal rate for 1989-1993 calibration period (ft <sup>3</sup> /s)	Percentage of average town withdrawal rate
Wilmington	919,100	249,500	253,400	923,000	2,345,000	0.119	2.31*	5.2
Danvers Water Supply	1,157,300	422,100	130,100	473,800	2,183,300	0.111	5.32	2.1
North Reading	581,500	169,800	93,400	340,200	1,184,900	0.0603	1.33	4.5
Peabody	790,900	329,400	200,100	728,900	2,049,300	0.104	5.44	1.9
Hamilton	340,300	994,300	89,100	324,400	1,748,100	0.0889	1.05	8.5
Ipswich	134,300	48,800	18,500	67,500	269,100	0.0137	0.42	3.3
Topsfield	265,900	74,700	89,900	327,300	757,800	0.0385	0.78	5.0
Wenham	150,100	46,000	30,000	109,300	335,400	0.0171	0.52	3.3
Salem Beverly Water Supply	1,929,000	1,200,800	280,200	1,020,500	4,430,500	0.225	15.8	1.4
Lynnfield	202,100	56,300	6,700	24,300	289,400	0.0147	0.47	3.1
Lynn	337,000	241,800	29,400	106,900	715,100	0.0364	1.08	3.4

\* The Wilmington withdrawal rate shown here reflects anticipated adjustments from 1989-1993 pumping rates, due to Wilmington's recent agreement to purchase water from the Massachusetts Water Resources Authority (MWRA).