COMMONWEALTH OF MASSACHUSETTS
DIVISION OF ADMINISTRATIVE LAW APPEALS

June 12, 2008

In the Matter of

TOWN OF NORTH READING

DEP Docket No. 2003-063
DEP File No. AP-3-17-213.01
North Reading

RECOMMENDED FINAL DECISION

WATER WITHDRAWAL - appeal from a water withdrawal permit modification under the Water Management Act , M.G.L. c. 21G, and its implementing regulations, 310 CMR 36.00. Following a hearing, the permit is sustained with (1) a minor modification of the limit on the volume of water the Town of North Reading may withdraw from its wells during the months of May through September, (2) a modification to a required notice to be provided to water supply customers of watering restrictions, (3) the addition of a condition requiring that, when growth is anticipated that will likely cause demand for water to exceed one percent of existing demand, the town report how it intends to meet the new demand and still comply with the conditions of the modified permit, and (4) a minor modification to a condition concerning water conservation by the town's ten largest industrial and commercial water users.

Gregg J. Corbo, Esq. (Kopelman and Paige, P.C.), Boston, for applicant/petitioner Town of North Reading.

Margaret Van Deusen, Esq. (Charles River Watershed Association), Weston, for intervenors Ipswich River Watershed Association, Inc., the Essex County Greenbelt Association, and a ten citizens group.

R. Bruce Allensworth, Esq. (Kirkpatrick & Lockhart LLP), Boston, for participant the Massachusetts Audubon Society, Inc.

Pamela Talbot, Esq., Boston, for the Department of Environmental Protection.

JAMES P. ROONEY, Administrative Magistrate.

Introduction

The Town of North Reading challenges three conditions in a modified water withdrawal permit the Department of Environmental Protection (DEP) issued to it in May 2003. The new

and stricter water conservation conditions, which DEP similarly imposed on other communities and water boards that withdraw groundwater from the Ipswich River basin, are meant to limit the impact of water withdrawals on the Ipswich River during periods when its flow is low. The town also challenges DEP's basic rationale for imposing these conditions, which is that water withdrawals are harming habitat in the Ipswich River during low flow periods and that restrictions on such withdrawals, particularly during the summer, can improve conditions in the river.

The Ipswich River Watershed Association, the Essex County Greenbelt Association, and a ten citizens group intervened in this appeal claiming that the river's capacity to accommodate withdrawals was being exceeded in violation of the regulatory requirement that withdrawals not be permitted beyond the "safe yield" of a water source, see 310 CMR 36.28(1)(j),[1] which is the "maximum dependable withdrawals that can be made continuously from a water source."[2] As a consequence, Intervenors request that DEP impose even more stringent conditions on North Reading. They advocate that a permit provision requiring the town to save two gallons of water for every new gallon of water demand once its total water allocation is exceeded be modified to impose this "water bank" at current water usage levels.

After hearings in these appeals, I affirm the three permit conditions the town challenged –

---

[1] DEP revised its Water Withdrawal Regulations in 2005. Citations in this decision are to the regulations applicable in both 2003 when the modified permit was issued and in 2005 when the hearing was held, unless otherwise noted.

[2] In full, the Water Management Act defines safe yield as "the maximum dependable withdrawals that can be made continuously from a water source including ground or surface water during a period of years in which the probable driest period or period of greatest water deficiency is likely to occur; provided, however, that such dependability is relative and is a function of storage and drought probability." M.G.L. c. 21G, § 2.

a cap on water withdrawals during the summer, a requirement that the town restrict lawn watering and other "non-essential" water uses when river flow drops below specified levels during the summer, and a requirement that the town either regulate private irrigation wells or ban lawn watering when river flow drops below a specified level – with two modifications: (1) the volume of water the town may withdraw in the summer is raised slightly and (2) the provision requiring North Reading to provide notice by newspaper to water supply customers when the river level falls to the point where watering restrictions are to be implemented is changed to allow the town more flexibility in choosing how it will inform its customers, while at the same time emphasizing the importance of speedy notification. I decline to impose a water bank on North Reading at its current level of water usage despite growth projections in water demand made by the town that may increase water beyond the volume of water saved by the conservation conditions imposed by the modified permit. Instead, I add a condition requiring that, in its annual report to DEP of water use in the past year, the town state whether growth in the forthcoming year will likely exceed one percent of existing demand and, if so, how the town intends both to meet this new demand and to adhere to the conditions of the modified permit. Finally, I have modified a condition concerning water conservation by the ten largest industrial and commercial water users in North Reading to emphasize DEP's goal of reducing water use by these water supply customers. I have listed these modifications in an appendix to this decision and direct that DEP prepare a revised permit that includes them, as well as any necessary changes to the deadlines for permit compliance.

Background

The Town of North Reading is located in the upper basin of the Ipswich River. It has two

sources for its public water supply – groundwater pumped from wells located in the town and water purchased from Andover. The six wells used by the town are all located in the watershed of Martin's Brook, a tributary of the Ipswich River. The volume of water the town may pump from these wells is governed by the Water Management Act, M.G.L. c. 21G, enacted in 1985, which allowed water suppliers to "register" current use, 310 CMR 36.04(1), and seek permits for any additional volume needed, 310 CMR 36.17(1). North Reading registered a volume of 0.96 million gallons per day (mgd) from its wells and, in 1991, obtained a permit for an additional 0.15 mgd for a total allocation of 1.11 mgd.

The water North Reading purchases from Andover is governed by an Interbasin Transfer Agreement because Andover is located in the Merrimack River basin. Under this agreement, in place since 1991, North Reading may purchase 1.5 mgd from Andover.

Historically, North Reading has used water from both its own wells and from Andover to supply its customers. Generally, the town pumps water from its wells at a rate that is fairly consistent throughout the year, and purchases more water from Andover in the summer to meet the increased demand in that season. The net result is that its overall usage of water from its wells and from Andover is fairly similar on an annual basis. The town does not withdraw on an annual basis the entire volume of water allocated it under the Water Management Act; nor does it purchase the entire volume its could under its agreement with Andover.

The Water Management Regulations contemplate review of water withdrawal permits every five years. After the first such review, DEP issued a modified permit in 1997. The original permit provided that the volume of water North Reading would be permitted to withdraw would increase over time, but the 1997 modified permit held the permitted volume to 0.15 mgd because

North Reading, like every other water withdrawer in the Ipswich River basin, was withdrawing less than its total water allocation. In addition, DEP added a condition to the permit requiring the town to notify users of the need to conserve water when stream flow in the Ipswich River fell below a designated flow level. In a cover letter, DEP informed the town that it had added this condition because of "concerns about the impact of water withdrawals on streamflow and aquatic habitat in the Ipswich River basin."

In addition, DEP urged North Reading to adopt a water use restriction bylaw because of the town's "unusually high" increase in water demand during the summer – town water use increases by 50 percent during the summer. The town responded by adopting a bylaw that at first urged water users to comply voluntarily with a watering schedule in which odd-numbered houses could water only on odd-numbered day and even-numbered houses could water only on even-numbered days. That aspect of the bylaw has since been made mandatory throughout the summer. The bylaw also provides that the Board of Supervisors may impose a limit on the hours a lawn may be watered, if it declares a water emergency.

The low flows in the Ipswich River that had led DEP to impose water conservation conditions in the 1997 modified permit also led it, along with other state agencies, to commission the United States Geological Survey to study the river. USGS issued its first report in 2000. It was entitled "Precipitation-Runoff Model for Analysis of the Effects of Water Withdrawals on Streamflow, Ipswich River Basin, Massachusetts." In it, groundwater modelers Phillip Zariello and Kenneth Ries, III simulated flows in the Ipswich River based on six different water withdrawal and land use scenarios and concluded that "cumulative ground-water withdrawals substantially decrease" river flow during low flow periods. In a follow-up report, Zariello also

concluded that bans on summer season withdrawals, reductions in summer withdrawals of 20 or 50 percent, and cessation of withdrawals when stream flow fell below a specified threshold, each "provided some degree of low-flow restoration."

David S. Armstrong, Todd A. Richards, and Gene W. Parker released a third USGS report on the river in 2001 entitled "Assessment of Habitat, Fish Communities, and Streamflow Requirements for Habitat Protection, Ipswich River, Massachusetts, 1998-99." Armstrong and his fellow authors sampled fish in the river in 1998 and 1999 and found that the fish community was dominated by warm water species that could tolerate ponding created by low flows in the river. They surmised that, if flows were maintained adequately, the river could support cold-water-tolerant fluvial (riverine) fish that are suited to live in a flowing water environment. They ultimately concluded that adequate aquatic habitat, including habitat for flow-dependent fish, could be restored in the Ipswich River by maintaining a minimum streamflow in the summer of 0.42 cubic feet per second per square mile (cfsm) and higher flows in the other seasons.[3]

At around the same time, representatives of government and environmental groups met to determine what types of fish could be expected to inhabit the Ipswich River if conditions in the river improved. This group included David Armstrong and Todd Richards, authors of the USGS Aquatic Habitat Study of the Ipswich River, Vernon Lang of the U.S. Fish and Wildlife Service, and Kerry Mackin, executive director of the Ipswich River Watershed Association. It concluded

---

[3] Cubic feet per second per square mile (cfsm) is a measure of how much water each square mile of a watershed contributes to flow in a river.

Cubic feet per second (cfs) is also used in this decision to refer to the volume of water that passes a point in the river at any given second.

These two measures of river flow are related. To determine how much each square mile is contributing to flow, the cfs flow rate at a point in the river is divided by the area of the watershed to arrive at a figure for cfsm.

that a "combination of dams, impoundments, water withdrawals and diversions and land use have created a number of ponded habitats in the mainstream and tributaries [of the Ipswich River] and have fostered conditions elsewhere in the river that provide pond type fishes a competitive edge over fluvial species." In a report titled "Ipswich River Target Fish Community," the group predicted that if conditions in the Ipswich River improved, fluvial species, which make up only 8.9 percent of the present fish population, would become 67 percent of the fish population.

DEP waited until the USGS studies were completed before embarking on its next five year review of North Reading's permit. On December 13, 2002, DEP sent a letter to Mark Clark, the Utilities Superintendent of the North Reading Department of Public Works, who functions as the town's Water Superintendent. In the letter, DEP stated that the USGS studies "provide documented evidence that water withdrawals along with export of wastewater to other basins substantially contribute to low flows in the Ipswich River." It informed the town that, once again, its permitted volume would not increase as originally scheduled, but would remain at 0.15 mgd. It also required the town to respond to an "order to complete," which was essentially a questionnaire concerning the town's use of water. In the order, DEP stated that its goal was to reduce town water use in the months from May to September, which, for purposes of this permit process, DEP calls the summer months. DEP told the town that its water use in the summer needed to drop by 20 percent from 1999 usage, both in terms of its overall water usage and its withdrawals from town wells in the Ipswich River basin. It also asked the town to assess whether the town watering restriction bylaw could be modified to "become a more effective tool for reducing seasonal water use." Specifically, it asked the town to describe how it would

implement watering use restrictions tied to daily flow levels in the Ipswich River, including restrictions between June 1 to October 31 if flow level fell to 0.42 cfsm in the river.

Clark responded in a March 14, 2003 letter that the town did not object to DEP maintaining its current permitted volume. He went on to say that the "North Reading Water Department recognizes seasonal water use, primarily resulting from residential lawn watering, as a concern and an issue that needs to be addressed." He attributed the difficulty the town had in achieving another conservation goal – a limit on residential customers to 65 gallons per person per day – primarily to higher seasonal water use in dry years. He stated that the town was "in the process of making a concerted effort" to reduce summer water use, but that a 20 percent reduction from 1999 usage would be difficult to achieve because of growth North Reading was experiencing, "including approximately 1% per year growth on the residential side and the connection of our largest commercial industrial water user (Teradyne)." As for tying watering restrictions to stream flows, Clark expressed no objection in theory, saying that "[t]here would be some educational benefits to connecting water restrictions to actual streamflows." However, he opposed the target streamflows listed by DEP because they were "too restrictive and place too much emphasis on restoring aquatic habitat over preserving water supply."

DEP issued North Reading a modified permit on May 19, 2003, the same day on which it issued modified permits to all other communities in the Ipswich River basin that have water withdrawal permits. The 2003 modified permit imposed more stringent conservation requirements on the town than did either the original permit or the 1997 modified permit. DEP's letter accompanying the permit stated that:

As a result of [its] review, the Department has determined that there is documented

> evidence that water withdrawals, and to a lesser extent an increase of impervious area and development, along with the export of wastewater to other basins substantially contribute to low flow in the Ipswich River. These low flows significantly impair the ability of the river to function as habitat for aquatic life and wildlife that are adapted to riverine conditions, [as a] recreation [area], and [as] a reliable source of safe drinking water.

To "reduce the adverse impacts on the ability of the Ipswich River to sustain all its uses," DEP established performance standards that it applied basin-wide. The standards include a limit on residential use of no more than 65 gallons-per-person-per-day on average, a limit on "unaccounted-for water" (leaks, for example) to 10 percent or less of overall water use, and a cap on total summer withdrawals.

Because communities had generally opposed a 20 percent across-the-board cut in summer water use, DEP reconsidered its approach for determining how much water each community must reduce its water use in the summer. DEP examined water usage from 1999 through 2002, focusing on the extent to which summer usage exceeded winter usage.[4] The average summer to winter water use ratio among water suppliers in the Ipswich River basin for that period was 1.4:1. As a general matter, DEP decided that communities whose summer/winter use ratio had exceeded 1.4/1 would have to reduce summertime water use by 50 percent of the difference between their summer and winter use. Communities whose ratio was below 1.4/1 would have to reduce use by only 25 percent of the difference between summer and winter water use.

Because North Reading has two types of water sources – one in the Ipswich River basin and one outside it – DEP modified the summer cap approach it applied to the town. It looked at the ratio of North Reading's overall summer/winter water use during the period from 1999

---

[4] DEP treated both summer and winter as five month periods, with summer including the months of May through September and winter including the months of November through March.

through 2002, which it determined to be 1.5 /1. Then, rather than seeking a reduction in overall use, it focused on reducing use from North Reading's Ipswich River basin water sources. It determined that in 1999, when the difference between the town's overall use of water in the summer and the winter from both its Ipswich and Merrimack River basin sources was the most divergent for the four year period it considered, North Reading pumped on average 0.522 mgd from its wells during the winter months and 0.526 mgd on average during the summer. This meant that during the summer the town pumped on average only an additional 0.004 mgd. Because its ratio exceeded 1.4/1, DEP required the town to reduce its usage by 50 percent or 0.002 mgd, which, with rounding, led DEP to limit North Reading's summertime withdrawals from its wells to 0.52 mgd.

DEP also required that North Reading impose watering restrictions when flow in the river falls below specified flow levels as measured by a USGS stream gauge at South Middleton, which is downstream from North Reading. Between the beginning of May and the end of September, when river flow falls below 0.56 cfsm at the Middleton gauge for three consecutive days, the modified permit requires the town to implement "voluntary" restrictions on "non-essential water use" (lawn watering, private pool filling, and non-commercial car washing) by its customers. When riverflow falls below 0.42 cfsm for three consecutive days – the minimum summertime streamflow recommended by the USGS Aquatic Habitat Study – the permit requires that mandatory restrictions be imposed on non-essential watering, including a ban on sprinklers and a ban on watering by hand-held hoses between 9:00 a.m. and 5:00 p.m. The flow levels that would trigger voluntary and mandatory restrictions are higher than the flow level set forth in the 1997 permit, which means that the town will have to impose watering restrictions more

frequently than it did in the past. To inform its customers of the need to adhere to voluntary or mandatory restrictions, the permit requires North Reading to file a "pubic notice that must appear at a minimum in a local newspaper within 5 business days of the date that the required action is triggered."

As many as 200 North Reading residents have private wells that supply irrigation water for irrigation. These wells do not need a permit under the Water Management Act because only water sources that produce above a 100,000 gallons per day threshold must be permitted. See 310 CMR 36.03 (definition of threshold volume) and 310 CMR 36.17. In North Reading, as in other communities in the Ipswich River basin with unregulated irrigation wells, DEP imposed a condition that requires the town to decide whether to regulate private irrigation wells or impose more stringent restriction on its water supply customers. In the permit cover letter, DEP stated that it imposed this condition because it recognized that the number of private irrigation wells might increase in response to the modified permit's watering restrictions, which would undermine the effort to limit nonessential water use in the Ipswich River basin. DEP informed North Reading that it could either enact local laws making private irrigation wells subject to the water withdrawal permit's limitations on nonessential water use or, failing that, ban all non-essential water use by its water customers during the summer when flow in the river falls below 0.42 cfsm for three consecutive days.

Aside from the restrictions imposed on residential water use, the permit also contains a condition requiring the town to "implement a program to reduce water use" by its ten largest industrial and commercial customers. The permit did not prescribe the details of this water conservation program. Rather, it requires the town to report on the effectiveness of the program

and leaves it to DEP to "take whatever action it deems appropriate to promote the interests of the Water Management Act."

DEP also required that North Reading file an annual statistical report. One of the items that must be reported is unaccounted-for water, which DEP defined as including "water that cannot be accounted for due to meter problems, ... unavoidable leakage, ... and fire protection." To limit unaccounted water, DEP requires that the town conduct a survey of its entire water system every three years so that it might then detect and repair leaks in its system. If an annual report shows that unaccounted water exceeded 10 percent in a given year or grew by 5 percent or more, then the town must also conduct a leak detection survey the following year.

Finally, the permit required that North Reading adopt a "water bank" after any year in which the total volume of water it withdrew from its Ipswich River basin wells exceeded its 1.11 mgd water allocation from that basin. In implementing this water bank, the town must conserve two gallons of water for every gallon of new water demand. The permit left it up to North Reading to determine how to achieve this.

North Reading appealed the modified permit. The town objected to three conditions in the permit – the summer cap, the streamflow triggers, and the private well condition. It asked that each be stricken from the permit.

After the District appealed, the Ipswich Watershed Association, the Essex County Greenbelt Association, and a ten citizens group moved to intervene in this and other appeals filed by Ipswich River basin water suppliers. These groups sought to present arguments that the permit conditions should be more stringent because water withdrawals were exceeding the "safe yield" of the basin. The towns of Hamilton and Topsfield opposed intervention. North Reading

did not file an opposition. On December 5, 2003, I granted the motion to intervene in this appeal and other pending appeals.

I held a prehearing conference in this appeal on October 1, 2003. I established a schedule for the parties in this and the other Ipswich River basin water withdrawal appeals to brief their legal objections to the modified permits with the hearings in each appeal to occur after the legal issues had been ruled on. North Reading subsequently filed a brief in which it asserted that DEP lacked legal authority to impose a restrictions on private wells at all or to impose a summer cap that effectively limited the town's ability to withdraw water under its registration.

On March 25, 2004, I issued a ruling on the legal issues that had been briefed. I decided that, as a general matter, the contested modified permit conditions did not exceed DEP's authority under the Water Management Regulations, including the private well condition and conditions that might in practice limit a community's use of a water withdrawal it had registered, so long as the contested permit condition had a permit-related purpose. See Ruling on Legal Issues, 11 DEPR 49 (Mass. Div. of Admin. Law Appeals, Mar. 25, 2004).

I held a hearing in this appeal on July 19-22, 2005, August 9-10, 2005, and September 19, 21, and 22, 2005. Testifying for North Reading were David P. Hanlon, Director of the town's Public Works Department, Mark Clark, the town's Water Superintendent, and John J. Gall, Jr., a civil engineer who has worked with the town on long range water supply options. Charles B. Cooper, whose professional career has involved fisheries studies, filed rebuttal testimony on behalf of the town. Kerry Mackin, the executive director of the Ipswich River Watershed Association testified for Intervenors. They also filed testimony from Louis Wagner, a regional scientist for the Massachusetts Audubon Society, but withdrew that testimony in favor of rebuttal

testimony from Todd Richards of the Massachusetts Division of Fisheries and Wildlife. DEP witnesses were Duane Levangie, Thomas Lamonte, and Richard Tomczyk, all of DEP's Water Management Program. Levangie is the program manager; Lamonte drafted DEP's strategy for restoring Ipswich River flow; and Tomczyk was the analyst who drafted the modified permit.

Discussion

While North Reading opposes only three of the conditions DEP imposed in the eleven page, single-spaced modified permit, it makes broad arguments attacking the bases of the permit modification generally. I will address these claims before turning to the specific permit conditions.

I. General Claims

A. Standing to Intervene

One of its arguments is not about the permit at all, but instead challenges the standing of the Ipswich River Watershed Association, the Essex Greenbelt Association, and the ten citizens group to intervene in this proceeding. The motion to intervene was made early on in the case, and I ruled on it soon thereafter. North Reading had an opportunity to oppose intervention at the time, but chose not to. I see no basis for revisiting the issue now because the hearing generated no new facts undercutting the Intervenors' standing. Kerry Mackin, the Ipswich River Watershed Association's executive director was not cross-examined on facts pertinent to the organization's basis for intervening. Other facts, such as the Association's continued involvement in the process leading up to the permit modification, bolster its standing to intervene.

All North Reading offers as a basis for reexamining my prior decision to allow intervention is a decision by Administrative Magistrate Natalie Monroe denying the Ipswich

River Watershed Association standing to appeal a Water Management Act permit issued for a watershed other than the Ipswich River watershed. See Matter of Town of Ipswich, Docket No. 2002-109, Decision and Order on Motions to Dismiss, 12 DEPR 199 (Mass. Div of Admin. Law Appeals, Nov. 2, 2005.) In that case, Magistrate Monroe found that the Ipswich River Watershed Association, whose corporate purpose is to "protect and restore the Ipswich River, had not shown that it would be injured by a project to occur in a different river basin, the basin of the Parker River." 12 DEPR at 201-202. Here, in contrast, the Ipswich Watershed Association has a direct stake grounded in its corporate purpose, as this appeal concerns the Ipswich River basin.

North Reading contends that the Association is simply seeking to protect a generalized public interest in water flow in the river, which cannot affect it differently than any member of the general public. Taken to its logical extreme, this argument would mean that the Association could never obtain standing no matter what specific facts it proved to demonstrate that a project would specifically affect it or interfere with the Association's ability to carry out its corporate purpose. North Reading makes no attempt to address the specific facts the Association alleges as the bases for intervention, whether in its lengthy motion to intervene or during the hearing regarding the Association's involvement with the water withdrawal permitting process in the basin. There is no reason for me to reconsider my decision, accordingly.

Furthermore, I reject as overbroad the town's claim that the Association can never establish standing no matter what facts are shown. It would be odd indeed for this agency or for DEP to ban environmental groups from appealing or intervening in environmental appeals.[5]

---

[5] An environmental group can always take advantage of M.G.L. c. 30A, §10A, which allows a group of ten Massachusetts citizens to intervene in an adjudicatory proceeding when damage to the environment may be at issue. It can either ask ten of its members to intervene in an existing appeal, or to

B. Ipswich River Watershed Association's Involvement in the Permit Process

North Reading's claim that the Ipswich River Watershed Association lacks sufficient interest to be involved in this appeal is striking in light of its other claim that the Association is too involved in water withdrawal permitting and that DEP, by issuing a modified permit in 2003 containing conditions advocated by the Association, was simply doing the Association's bidding. DEP witnesses denied this allegation, of course, and no doubt that is not the way the Ipswich River Watershed Association sees the matter – in fact, it sued DEP at one point before the permits in the Ipswich River basin were issued. But even if it were true that DEP simply chose to follow a path laid out for it by the Association, no relief would be available to the town as a consequence. DEP need not generate internally every idea it uses in a permit; it can, and does, consider and accept ideas generated outside the agency. The validity of this permit depends on whether it comports with regulatory standards, not on whether the permit conditions were thought up solely by DEP.

No doubt the town is aware of this already. I take this argument, then, to be an expression of frustration on the town's part with a permitting process that it perceives as allowing the Association too influential a role. There is no question that the Ipswich River Watershed Association has been involved in one way or another in the permitting process for some time, but that is largely because it chose to take sometimes an active stance (writing then DEP Commissioner Lauren Liss in September 2002 with a list of proposed permit conditions)

---

commence an appeal, it can ask ten of its members to appeal while at the same time moving to intervene. The Ipswich River Watershed Association chose the former route and had ten of its members intervene in North Reading's appeal. North Reading challenges the ten citizens group's claim that environmental damage is at issue here, but I see no reason to revisit my prior ruling that such damage is at issue.

and sometimes an aggressive posture (the lawsuit) in making its views on river protection known.[6]

The town, on the other hand, paints a picture of a permitting decision made, until the final stages, without its participation or knowledge. Town Water Superintendent Mark Clark, in responding to the order to complete in March 2003, stated "[i]n terms of managing water withdrawals to sustain all designated uses, North Reading believes it has and continues to a manage withdrawals so as to have minimal impact on the other uses of the river." The immediate impression this statement leaves is that the town did not fully appreciate, even as late as two months before DEP issued the modified permit, that DEP was about to impose far more stringent conditions on all water withdrawers in the Ipswich River basin, including North Reading.

But even if the town did not know what conditions DEP was considering imposing in the modified permit until the order the order to complete presented versions of a summer cap and a streamflow trigger, that is not actionable *per se*. It is noteworthy here because this is not the end of the permitting process. In several years, North Reading will again have to obtain a water withdrawal permit from DEP. Former DEP Commissioner Robert Gollege, in an earlier decision on water withdrawal permits in this basin, urged municipalities in the future to make their views

---

[6] Members of the Ipswich River Watershed Association and the Essex Greenbelt Association, along with employees of DEP and other government agencies, served on the Ipswich River Fisheries Restoration Task Group. This group issued a report in June 2002 that included recommendations for restoring fisheries in the river. The Target Fish Community report was part of this work. The Association prepared a Draft Regional Water Conservation Plan in July 2002, which was created with the cooperation of municipal officials in all 15 communities that use water from the Ipswich River basin. The Association also obtained funding from the Executive Officer of Environmental Affairs for an "Ipswich River Watershed Management Plan," which was issued in January 2003.

known to DEP before the final permit had been issued so that differences could be resolved without the time and expense of litigation. See Matter of Towns of Hamilton, Topsfield, and Wenham, Docket No. 2003-065, Final Decision, 13 DEPR 98 (Mass. Dep't. of Envt'l Prot., Mar. 27, 2006). I would add that the modified permit conditions are based largely on predictions of what will happen to the river if water withdrawals are restricted. The next time North Reading's permit is considered, data will be available on the impact of those conditions. Needless to say, those results may be open to interpretation. It would be best for all concerned if the town, DEP, and, of course, the Ipswich River Watershed Association and the other Intervenors continued to communicate long before the next permit is issued to discuss the data and determine what steps are necessary to protect the river while providing needed water to the town.

C. Safe Yield

That discussion would be helped considerably if a matter on which the Association has been pressing DEP is resolved: safe yield. As previously noted, the Water Management Act defines safe yield as "the maximum dependable withdrawals that can be made continuously from a water source." M.G.L. c.21G, § 2. When the modified permit was issued and when I held the subsequent hearing, the Water Withdrawal Regulations defined safe yield as the "maximum annually averaged daily water use consumptive loss rate [the rate at which water is used and not returned to the water source from which it is withdrawn] that can be sustained from a water source with an acceptable degree of risk." 310 CMR 36.03.[7]

Safe yield plays a significant role in the water withdrawal permitting process because, when issuing a water withdrawal permit, DEP may not allow the permit holder by itself or in

[7] The regulatory definition of safe yield has since been revised to track the statutory definition.

combination with other permit holders relying on the same water source to withdraw water in excess of the safe yield of that source. See 310 CMR 36.28(1)(j). During a five year permit review, DEP must also consider "any available safe yield information." 310 CMR 36.33(4).

When DEP first determined the safe yield of the Ipswich River basin, it concluded that 3.29 mgd of water was available to be allocated above and beyond the water volumes registered in the basin. DEP witnesses testified that it has since altered its opinion and concluded that the basin is over-allocated, in part because on occasion the upper part of the river dries up completely and the whole river regularly experiences low flows. DEP also came to doubt the accuracy of the method it originally used to calculate safe yield, but, at the time of the hearing, it had not come up with a new calculation method, let alone a new safe yield figure.[8]

---

[8] When DEP first issued water withdrawal permits in the Ipswich River basin, it calculated the safe yield of the basin based on a method alluded to in the Water Withdrawal Regulations then in effect, 310 CMR 36.31(2) and (3). This method considered three inputs: the summer stream flows in the Ipswich River in 1980 and 1981, the size of the drainage area in the Ipswich River basin, and a "reference streamflow" value for the Ipswich River developed by the Water Resources Commission of the Executive Office of Environmental Affairs. The Commission is charged under M.G.L. c. 21G, § 3, ¶ 2, with adopting "principles, policies and guidelines necessary for the effective planning and management of water use and conservation in the commonwealth."

In a preface to a revised version of the Water Withdrawal Regulations promulgated in 2005, DEP stated:

> The science underlying the proper management of the state's water resources has evolved since the initial promulgation of the Regulations. The Department now has more information and a better technical understanding of the importance of natural variation of streamflow in maintaining water resources and the effect that water withdrawals and other human influences have on the sustainability of such water resources for present and future generations. Consequently, the Department has amended the Regulations to more specifically reflect current scientific knowledge, thereby furthering the goal of insuring the preservation of the water resource itself and determining an appropriate balance among competing water withdrawals and uses.
>
> Consistent with the above theme, the Department has determined that the original regulatory definition of "safe yield," which is more narrow than the definition of this term in the Act, no longer sufficiently comports with the most current and protective technical basis for determining

The absence of a new safe yield figure has created uncertainty. Intervenors argue that safe yield is being exceeded and thus more stringent measures must be taken to protect the river.[9] North Reading, on the other hand, contends that without a new safe yield figure, DEP has no safe-yield-related basis for imposing further water restrictions on the town.

Intervenors point out that the formula DEP originally used to calculate the safe yield of the Ipswich River was based on the method then included in the Water Withdrawal Regulations.

> safe yield. The concept of safe yield is fundamental to the proper management of a water source, taking into account the natural variability of streamflow, and serves as the principal regulatory basis for determining the scope of permitted water withdrawals in a water source. The Department is working on a more refined, longer term approach to determining safe yield using the latest United States Geological Survey ("USGS") research. Upon the completion and evaluation of this research, the Department expects to undertake a more comprehensive revision of the Regulations in the future. In the interim, the Department has amended the Regulations to eliminate the original, obsolete definition of safe yield, and inserted in place thereof the broader, more accurate definition of safe yield in the Act.

As a consequence of these changes, the Regulations no longer mention the safe yield calculation method that relied on a reference streamflow. Instead, the Regulations now list factors that DEP may consider in developing the safe yield of a water source, including "the natural variability of streamflow and aquatic habitat protection" and the "hydrologic impacts of proposed, existing and permitted withdrawals." 310 CMR 36.31(1)(a) and (c)(2005 rev.).

[9] Intervenors did not ask that DEP be required to recalculate safe yield before the modified permit is finalized because that would simply delay issuance of the permit and thus the imposition of new water conservation measures Intervenors favor. Although Intervenors argued that the USGS studies provided new information pertinent to safe yield, they did not propose a specific manner in which the knowledge obtained from those studies could be used to redetermine safe yield. Indeed, no party offered any evidence that there exists a currently accepted method for calculating the safe yield of a river. Instead, as a fall-back position, Intervenors urged that DEP could, to meet its obligation to consider safe-yield-related information, adopt stringent water conservation conditions that would limit withdrawals.

I note that, in a court appeal of a final decision in the modified water withdrawal permit issued to the Town of Hamilton, Intervenors obtained relief on the safe yield issue from Superior Court Judge Elizabeth Fahey. While affirming the permit as approved by a final decision of the DEP Commissioner, Judge Fahey found that DEP had an obligation to know the safe yield of a water source in order to meet its obligation to ensure that the town's "withdrawal in combination with other registered and permitted uses [does] not exceed the safe yield of a water source." 310 CMR 36.28(1)(j). She ordered DEP to "develop a scientifically sound methodology for determining safe yield and implement it to calculate the safe yield of the Ipswich River basin." Town of Hamilton v. Massachusetts DEP, Essex Sup. Ct. Civ. Action No. 06-745, Memorandum of Decision and Order on Cross Motions for Judgment on the Pleadings, July 13, 2007 (Fahey, J.)

One factor in the method was a "reference streamflow," which was a flow number developed by the Water Resources Commission of the Executive Office of Environmental Affairs. The reference streamflow the Water Resources Commission determined for the Ipswich River in the early 1990s was 0.21 cfsm. Intervenors point out that if the streamflow DEP used in its streamflow trigger conditions – 0.42 cfsm – is used in the old formula, the resulting calculation would show that there is no water to be allocated in the Ipswich River basin beyond the registered water withdrawals.

Although that result is dramatic, it is not determinative. DEP has lost confidence in the formula it previously used, and Intervenors are not advocating its use either. DEP analyst Thomas Lamonte testified that the present thinking is that relying on one year-round streamflow number as the basis for calculating safe yield fails to account for the natural variability of rivers.

Intervenors did not disagree with Lamonte on this point, but rather maintained that there is other quantifiable evidence that the safe yield of the river is being exceeded. They point out that the Ipswich River Watershed Management Plan – prepared by an engineering firm for the Ipswich River Watershed Association with funding from the Executive Office of Environmental Affairs – concluded that there is a 9 mgd water deficit in the upper Ipswich River basin and that this deficit will not be made up by the conditions DEP imposed.

The Plan, however, does not project that the water deficit would be made up entirely by restrictions on water withdrawals. Nor does the Plan purport to be a stand-in for a future recalculated safe yield. The approach DEP took appears to be a reasonable effort to focus on the factors it would consider once it has determined how to calculate safe yield, taking into account the natural variability in a river's flow. It limited withdrawals during the summer, when the

weather is generally driest and water use is at its height, and placed an additional limit during the summer that focuses on flow levels in the river. Whether the particular conditions it imposed are adequate, I will address later on.

As for North Reading's contention that DEP could not impose new conditions based on safe yield when it had not recalculated safe yield, DEP did not literally do so.[10] Still, the conditions DEP imposed and the arguments it made in support of those conditions are imbued with the notion that more water is being withdrawn from the basin than the river can tolerate. That some of DEP's actions are to some extent related to safe-yield is hardly impermissible as the agency may not permit water withdrawals that exceed safe yield. See 310 CMR 36.28(1)(j). But in the absence of new safe yield calculation, those conditions cannot be justified based on safe yield *per se*. And indeed, DEP agues in favor of those conditions, not based on safe yield, but as a proper response to the knowledge it gained from the USGS studies.

D. Use of USGS Studies

North Reading arrays a multitude of arguments against the use of the USGS studies to justify the conditions in the 2003 modified water withdrawal permit. It first argues that DEP's authority to make permit changes during a five year review is significantly constrained.

1. Five Year Review Limits

During that review, the Water Withdrawal Regulations provide that DEP will "review for

[10] North Reading also claims that safe yield has no bearing on this case because, with one of its water sources in the Merrimack River basin, it puts more water back into the Ipswich River basin than it withdraws. This argument is irrelevant to the safe yield issue. If, for example, the volume of registered water withdrawals in a basin exceeded the safe yield of the basin, then no community in the basin could obtain a permit for additional water withdrawals, even one like North Reading that adds water to the basin.

adequacy and compliance all permit conditions and provisions, additional information submitted by the applicant, and any available safe yield information" and, following the review, DEP "may modify permit conditions accordingly." 310 CMR 36.33(4). The Regulations also provide, in pertinent part, that DEP may at any time modify a water withdrawal permit if the permit holder has violated the Water Management Act, M.G.L. c. 21G, or its permit, the modification is "necessary for the promotion of the purposes of M.G.L. c.21G," or "the safe yield of, or other indications of stress on the water source requires such action for the protection of public health, safety and welfare." 310 CMR 36.29(1),(2), and (3).

North Reading treats the general permit modification provision of 310 CMR 36.29 as a limit on the circumstances in which DEP can modify a permit during a five year review. That is not obviously the case, as 310 CMR 36.29 purports only to describe when DEP may deviate from the normal permit issuance and review process and take action to modify a permit that is otherwise not under review.

As for the five year review process, during it DEP must "review for adequacy ... all permit conditions." 310 CMR 36.33(4). The town maintains that this means that DEP may modify permit conditions to promote the interests of the Act only if it finds that the conditions imposed previously were inadequate. The regulatory language is not so narrow. DEP need not focus exclusively on its former permit conditions and find them inadequate before it imposes new conditions. Rather, it may during a review consider anew what conditions are appropriate. That appears to be what DEP did in issuing both the 1997 and 2003 permit modifications.

Even if 310 CMR 36.29 states a general limit on DEP's authority to modify a permit during a five year review – a proposition I doubt for the reason just stated – I do not see how this

benefits North Reading. It is true that some of the reasons the provision list that would justify a permit modification have no bearing here. DEP does not allege that the town has violated the Water Management Act or its 1997 permit modification. North Reading argues as well that the "safe yield or other indication of stress" provision cannot justify additional conditions because, even if the USGS studies show that the river is under stress, the provision allows modifications only for "the protection of public health, safety and welfare" but not to redress environmental harm. Even if I were to accept this limited reading of the 310 CMR 36.29(3), that still leaves the catch-all provision, 310 CMR 36.29(2), which allows DEP to modify a permit when "such action is necessary for the promotion of the purposes" of the Water Management Act." The Act's purposes are broad, and require DEP to consider the impact of water withdrawals on such things as "water-based recreation, wetland habitat, [and] fish and wildlife." M.G.L. c.21G, §7(9). Hence, DEP could impose new conditions under either the catch-all provision (310 CMR 36.29(2)) or under its five year permit review authority (310 CMR 36.33(4)), so long as it had sufficient reason for imposing the new conditions.

2. Evidence of River Flow Impairment

North Reading contends that DEP lacked sufficient reason to make the changes it did. It maintains that there is no compelling evidence that flow in the Ipswich River is impaired at all, let alone impacted by water withdrawals. Mark Clark, the town Water Superintendent, examined USGS river flow data from 1939 on and found that over time, not only had the mean flow in the Ipswich River increased, but mean flow in the normally low flow month of August had as well. He also found that flows below 0.42 cfsm were not increasing over time, while extreme low flows such as 0.05 cfsm were slightly decreasing over time. He testified that the occasions on

which flows decreased at any given time were directly related to declines in rainfall.

The USGS Precipitation-Runoff Study, on which DEP relied to conclude that water withdrawals are impacting river flow, considered data on historic river flow, rainfall, and water withdrawals. The USGS determined that water withdrawals were causing flows in the river to decrease during low flow periods, not during high or average flow periods. Thus, Clark's conclusion that average flows in the Ipswich River have increased in the last 80 years is not inconsistent with the USGS's determination, and it is not surprising given the evidence in the record that average annual precipitation in the basin has increased over the same time period.

As for low flow periods, which USGS and DEP treat as more significant for habitat evaluation purpose, the USGS study does not, as Clark does, simply examine a timeline of historic low flows. It instead modeled the available flow, precipitation, water withdrawal and land use information and sought to determine what would happen to flow depending on how land use in the basin and water withdrawal changed. USGS focused on the probable minimum flow over a seven day period that will occur on average every ten years; this "7Q10" figure is a "widely used regulatory statistic," according to USGS. It concluded that the 7Q10 would be 4.1 cfs at the South Middleton gauging station based on 1991 land use conditions and no withdrawals, but would be only 0.54 cfs with the same land use conditions and average water withdrawals – a projected difference of nearly an order of magnitude.

Clark's work is simply not as sophisticated an approach to low flow data as the one taken by USGS for it does not attempt to incorporate water withdrawal information into the analysis. It simply assumes that if water withdrawals were truly causing an impact on flow in the river, the results over time should have shown a direct correlation between increased water withdrawals

and more frequent low flows. But Clark did not introduce corresponding data to show how water withdrawals have changed over time in the basin. There is little evidence on this in the record. What is clear in the record is that none of the communities in the basin with water withdrawal permits are using their entire water allocation, and none have had the volume of water permitted increased as was originally anticipated when permits were first issued in the early 1990s. Thus, water withdrawals in the Ipswich River basin have, at the very least, not grown dramatically since the Water Management Act was implemented. This relative lack of change in water withdrawals means that simply looking at how often low flows occur in the river over time may not help to answer whether or by how much water withdrawals have affected low flow levels or their frequency.[11]

While the parties spent much time debating whether conditions have been made worse in the river over time because of water withdrawals, that does not appear to be the principal focus of the USGS Precipitation-Runoff Study, nor is such a finding necessary to support implementing the conditions imposed in the modified permit. The Study simply attempts to extract from available information what the impact of water withdrawals is on river flow. This is new information and, to the extent the Study shows that current withdrawals have an impact on low flows, it can be used by DEP to add conditions to the permit meant to address problematic low flows that are tied to water withdrawals.

---

[11] The conditions DEP imposes in the modified permit are meant to change the level of water withdrawals, particularly during the summer. But even if the changes in water withdrawals are as much as expected by DEP, the difference in water use will not be as dramatic as the difference between the no-withdrawals and 1991 withdrawal levels USGS examined when attempting to determine the impact of withdrawals on the 7Q10 figure. Thus, the parties need to give some thought before the next round of permitting to figuring out a method to discern the impact of the conditions on flow.

3. Adequacy of USGS Aquatic Habitat Study

But at what level are low flows problematical? DEP looked to the USGS Aquatic Habitat Study, which had concluded that adequate habitat could be restored to the Ipswich River by maintaining a minimum flow in the summer of 0.42 cfsm. USGS reached this conclusion after examining four "riffle" sites in the river, which are shallow sections of the river where water ripples over rocks. It identified these sites as "critical habitat areas because they are among the first sites to exhibit fish-passage problems or to run dry during low flows." USGS averaged the results of four different methods for determining streamflow and hydraulic requirements of the riffle sites and concluded that a minimum summer flow of 0.42 cfsm would provide adequate flow to restore habitat in the Ipswich River. The related Target Fish Community report concluded that if flow were restored, the fish composition in the river would change from one presently dominated by fish species that are generalists and can tolerate ponded conditions to one that will be dominated by species that prefer to live in flowing water.

North Reading challenged the USGS Aquatic Habitat Study from a number of angles. It asserted that if what was truly harmful about the present condition of the river was the acknowledged instances in which the upper portion of the river dried up and fish died, then what was needed to address that problem would be a determination of what streamflow threshold corresponded with the onset of significant fish mortality, a question it claimed the Aquatic Habitat Study did not answer. On that score, the town claimed that factors other than streamflow affect fish mortality and that some of these factors – water quality, temperature, and impoundment – were not accounted for by USGS, which the Aquatic Habitat Study acknowledged. The town argued that a different approach than the one taken by USGS would

have arrived at a more accurate assessment of the factors pertinent to fish mortality. It noted that the authors of the Aquatic Habitat Study observed that "[o]ther methods, such as Instream Flow Incremental Methodology ('IFIM') ... could be applied to account for factors other than flow as a limit on aquatic life."[12] One of the town's witnesses, engineer John Gall pointed out that an IFIM study performed on the Saugus River found that maintaining a flow of 0.29 cfsm would provide adequate fish habitat. While not claiming that the result would necessarily be the same in the Ipswich River, he asserted that the failure to conduct such a study left it unclear whether flows lower than 0.42 cfsm could nonetheless sustain a reasonable fish assemblage – and thus make watering restrictions when flow reached 0.42 cfsm unnecessary.

DEP's witness Thomas Lamonte responded that the agency left it up to USGS to decide which methods to use to evaluate the river. He acknowledged that an IFIM study would provide additional information, but testified that such a study has limitations because it is location and species specific, which means that before such a study could be performed, specific fish species would have to be chosen to be the focus of the study. In contrast, according to Lamonte, the USGS chose methods that allow a more basin-wide evaluation of fish habitat generally.

I find that DEP could rely on the USGS Aquatic Habitat Study as presenting sufficient new information about what flows were necessary to maintain adequate habitat in the river. While additional information might have proved helpful, the lack of an IFIM study does not by itself demonstrate that DEP lacked information necessary to impose new conditions designed to improve the habitat value of the river.

That the USGS Habitat Study did not identify a flow level directly related to fish kills

---

[12] The record does not contain a detailed description of what an IFIM study entails.

hardly undermines its utility. DEP seeks not simply to prevent fish kills, but to improve habitat in the river habitat generally. North Reading does not claim this goal is illegitimate; instead, it questions DEP's position that habitat will improve as a result of water withdrawal restrictions.

4. Options to Respond to Low Flows

In this vein, North Reading emphasized the impact of impoundments on flow in the Ipswich River. It maintained that the Ipswich River is a naturally low gradient, low flow river in which flow has been further reduced by manmade dams in the main channel. It questioned the utility of trying to determine the health of the river based on conditions at four riffle sites when these features are not typical of the river, which is predominantly made up of what USGS described as "pool and glide" stretches. Town witnesses asserted that if improving flow is the object, then other simpler steps could be taken that would have more immediate affect on flow, such as dam removal or creating channels in the riffle areas so that flow would be maintained even when the river level drops. Similarly, they suggested that channels could be dredged in the stretches of the river that run dry, so that fish would have a means of escape to the pools where water remains.

As noted earlier, the USGS emphasized riffle areas because, as flows decline, they are "among the first sites to exhibit fish-passage problems" or to dry out. Fisheries biologist Todd Richards, one of the authors of the Aquatic Habitat Study, testified that improving flow at the riffle sites would improve flow throughout the river generally. He acknowledged that increasing flows would still leave impounded stretches of the river upstream of dams, but testified that even in these stretches, increased flow would improve habitat.

Even if Richards is correct, should dam removal and other physical changes to the river

that would appear to have a more direct impact on conditions in the river be undertaken before restrictions on water withdrawals are imposed on North Reading and other communities in the Ipswich River basin? There was general agreement that other steps should be considered to improve habitat in the Ipswich River. The Ipswich River Fisheries Restoration Task Group reported in June 2002 that a "Dam Study Group" was considering "whether specific dams may be appropriate candidates for removal to improve stream flows, habitat and fish passage." And Kerry Mackin testified that the Ipswich River Watershed Association had already taken part in a project to provide for fish passage at one of the dams in the river. But there was no general agreement on the utility of the proposals made by the town's witnesses or the timing of implementing those proposals. For example, Richards testified that his agency, the Massachusetts Division of Fish and Wildlife, would not be interested in re-engineering the riffle areas because its mission is to restore habitat to its natural condition, more or less, rather than to improve habitat through further alterations.

But whether approaches such as dam removal or streambed reconfiguration may be usefully employed to benefit river flow, there is no evidence that DEP, in administering the Water Management Act, could require North Reading or any other community in the Ipswich River basin to undertake such actions. Nor is there any statutory or regulatory provision that would require that all other steps be taken to improve river flow before DEP imposed conservation measures meant to limit water withdrawals. Rather, the Regulations provide that DEP is to consider "reasonable conservation practices and measures" as factors when issuing a water withdrawal permit. See 310 CMR 36.26(1)(h). Conservation measures and practices in this context must necessarily involve less use of water, which is what the modified permit

conditions require. I conclude that DEP need not defer requiring conservation measures until the effect of dam impoundment on riverine habitat is resolved.

5. Impact on Fish Habitat

Of course a general authorization to impose conservation measures does not make every potential conservation measure a reasonable requirement in every context. Here, if the limits the modified permit would impose are unrelated to DEP's goal of improving flow and thereby habitat in the river, then they would be unreasonable. In the context of improving habitat, if changes in flow will likely have no habitat impact absent dam removal, for example, then conditions designed to improve flow would be premature at least. On this score, the parties agree that, unless dams are removed or fish passages installed, the habitat of anadromous fish, which are fish that enter fresh water from the ocean to spawn, see 310 CMR 10.35(2), will not be improved. DEP has not made that its goal, however. The goal is the improvement of river habitat generally and habitat for fluvial (riverine) fish specifically. On that score, Richards testified that "[y]ou have to ... reduce the severity and extent of low-flow events in order to be able to begin having restoration on the Ipswich. Without addressing that flow issue, physical habitat alterations, dam removal, everything else, [is] relatively unimportant." While the witnesses for North Reading disagreed with the primacy that Richards gives to flow restoration, they did not question that flow could be improved in the river or that flow improvement would have some impact, even absent other changes to the river.

Town witness Charles Cooper questioned whether changes in flow regime, even if achieved, would dramatically change the nature of the fish population. He focused most of his attention on the Target Fish Report, which predicts a dramatic shift toward a fluvial fish

population from the present population dominated by "macrohabitat generalist" species tolerant of ponded conditions, if flow in the river improves. In order to determine what the fish population would look like if conditions changed, the authors of the Target Fish Report first looked for a comparable river in the vicinity of the Ipswich that was relatively unimpaired. They chose the Lamprey River, 30 miles north of the Ipswich in New Hampshire. They then used studies of the fish population in the Lamprey to predict what the fish population would be in the Ipswich River if flow improved.

Cooper questioned the comparability of the Lamprey River, saying that at its headwaters it is at a higher elevation (400 feet) and steeper than the Ipswich River, where the highest elevation is 110 feet, and that the sampling done on the Lamprey prior to issuance of the Target Fish Report had been on the upper, non-comparable stretches of the river. He noted as well that the fluvial fish the Report believed would come to be the predominant fish in the Ipswich were by and large minnows. He saw no benefit to changing the fish community to favor minnows over some of the generalist fish (red pickerel, sunfish) that now predominate in the Ipswich and are sought by recreational fishermen.

While Todd Richards disagreed that the elevation of the upper reaches of the Lamprey played a role in the type of fish found there, I need not decide whether Richards or Cooper is right on this score, for sampling was performed in the lower 12 miles of the Lamprey River in 2003 – after the Target Fish Community Report had been issued. The parties disagree on the meaning of the data obtained in this sampling. The town sees it as confirming its position that the fish species composition changes as elevation decreases. It focuses on the last four miles of the Lamprey, which has a fish population similar to the existing population in the Ipswich River.

macrohabitat generalists make up 83 percent of the fish population there. DEP and the Ipswich River Watershed Association object that the last four miles of the Lamprey River is not representative because 65 percent of it is impounded. They prefer to examine the entire 12 mile stretch, all of which is below 100 feet in elevation and where 60.7 percent of the fish sampled were made up of fluvial species. They see this data as confirming that the fluvial species listed as target fish do inhabit low, flat stretches of the Lamprey River in abundance, and hence could be expected to return in numbers to the Ipswich River once flow improved.

Although the latest sampling of the lower reaches of the Lamprey River is open to interpretation, it provides at least some justification for DEP's prediction that the fluvial fish population will rebound if flow can be improved in the Ipswich River. That the particular fish species that are likely to increase in number are minnows was not of great import to USGS because it was seeking simply to determine what would happen to fish populations if flow increased in the Ipswich River. But it does have at least some bearing on DEP's responsibilities under the Water Management Act because recreational fishing is one of the uses of the Ipswich River and the impact of permit conditions on this use must be considered. See M.G.L. c. 21G, § 7(9). I am not convinced, however, that an increase in the number of minnows would necessarily come at the expense of game fish because Richard's testified that if flow were to increase, the generally improved habitat would allow for a larger fish population and, thus, no decline in the population of game fish.

The record is replete with other disputes about the handling and interpretation of fish data. North Reading argued that fish sampling performed on other rivers in southern New England showed that the fluvial species listed in the Target Fish Community could not be

expected in the Ipswich River; in addition, it claimed that sampling done in the Ipswich River in 1955 confirms that the fish population found in the sampling in the late 1990s was not unusual, but accurately reflected a river system in which macrohabitat generalist fish could be expected to dominate.

Richards worked on the study of rivers in southern New England to which the town referred. He acknowledged that the fish populations in these rivers did not match those in the Target Fish Community Report. But he testified that he did not expect that to be the case because the rivers examined in the study all had watersheds much smaller than the Ipswich River's. As drainage areas increase, so do the types of habitats in a river and the types of species to be found in a river, according to Richards, and thus these small rivers are not comparable to the Ipswich. I credit Richards' expertise on this matter, and accordingly find that the study he performed on rivers in southern New England sheds little light on the probable fish species composition in the Ipswich River if flow improves.

I do not find the 1955 data all that useful either. North Reading points out that redfin pickerel, sunfish, and eels dominated in both 1955 and later surveys, and that minnow species were found at very few of the sampling sites in 1955, suggesting that minnows were not prevalent then. The Ipswich River Watershed Association responds that one of the minnow species, fallfish, made up 20 percent of the fish population then, as opposed to three percent in the more recent surveys. The data thus suggests both some continuity in fish populations and some differences over time. The continuity hardly demonstrates that the fluvial fish in the Target Fish Community can never be induced to populate the Ipswich River because the basin was subject to withdrawals in 1955, although there is no evidence in the record as to the level of

water withdrawals at that time. The difference between the number of fallfish present in the river in 1955 and more recently hints at some change in river habitat over time, but without more evidence the difference cannot necessarily be tied to withdrawal levels.

The town asserts that the difference is probably the result of undercounting of minnows in the 1998-99 Ipswich River fish survey, because some minnows were seen but not captured and thus not counted, while others that were captured were deliberately left out of the final results. I am not going to second-guess USGS's fish sampling protocol. There is no evidence that the approach of counting only captured fish, rather than including fish seen but not captured, was anything but an accepted practice. The evidence suggests instead that this approach was similar to the approach in the various fish surveys in the Ipswich River that were performed during the past 50 years. Therefore, it does not call into question the data obtained during the 1998-99 fish survey. As for not counting some fish that were captured, fish identified as young of the year were left out of the final tally because of their high mortality rate. This is a professional judgment left to the survey team.

I conclude that the USGS studies showed that groundwater withdrawals have an impact on flow and fish habitat in the Ipswich River, and that these studies therefore provided a proper basis for imposing conditions on groundwater withdrawers, as DEP did here.

E. North Reading's Water Use

1. Impact of Water Purchases from Andover

North Reading argues that even if the USGS studies might be used to justify imposing more stringent conditions on other communities in the Ipswich River basin that rely on the basin's groundwater sources, the studies do not justify imposing conditions on it because it

imports half its water from another basin. North Reading contends that the combination of its extensive water importation and the water return its customers make to the basin by using septic systems makes its net impact on the river positive, in the sense that it returns more water to the basin than it withdraws. Engineer John Gall prepared a table showing the town's withdrawals, its total water use, and its returns to the basin. From this table, Gall concluded that, even in the summer, when much of the water used for watering transpires away and does not return to the basin, the town returns more water to the basin than it withdraws.

DEP does not dispute that overall North Reading returns more water to the basin than it withdraws. As a consequence of this positive impact, DEP placed North Reading in the category of communities on which it imposed the least restrictions. North Reading objects to the conditions like the summer cap and the stream flow triggers that were imposed on all communities and asserts that there can be no justification for them if the town's impact on the river is positive.

Both DEP and the Ipswich River Watershed Association respond that North Reading's withdrawals have a negative impact on Martin's Brook, where the town's groundwater wells are located. The record contains much testimony about whether Martin's Brook is stressed by the town's withdrawals, the gist of which is that the Brook suffers some stress but not as much as the mainstem of the river.[13] Moreover, the town objects to DEP's reliance on alleged impacts to the

[13] The signs of stress in Martin's Brook come from both observation and calculation. In the eleven summers Mark Clark has worked for North Reading, he has seen the brook run dry during four of them: 1995, 1997, 1999, and 2002. DEP's witness Thomas Lamonte, using the computer program used by USGS to evaluate conditions in the entire river system, sought to isolate the impacts of withdrawals on Martin's Brook. His calculations showed that, absent pumping, the brook would always flow and that pumping causes the brook to cease flow 23 percent of the time. Kerry Mackin, testifying for the Ipswich River Watershed Association, stated that she applied a method used by the Water Resources Commission

Brook as a *post hac* rationalization that was not the basis on which DEP imposed conditions in the modified permit in the first place.

DEP need not necessarily limit its defense of the modified permit conditions to the reasons it had in mind when issuing the permit, but any subsequent additional attempts to justify the permit must be rationally related to the permit conditions.

The evidence shows a reasoned connection between the summer cap and flow in Martin's Brook. All of North Reading's wells withdraw water from the sub-basin that feeds the brook. Most of its wells are in the vicinity of the brook and, as a consequence, withdrawals have a direct impact on flow in the brook. But most of North Reading's customers do not live in this sub-basin, thus any returns they make to the water table through their septic systems do not end up benefitting flow in Martin's Brook. By limiting withdrawals from the Martin's Brook sub-basin when rainfall is low but water use is ordinarily at its highest, the summer cap will keep more

---

to determine stress in a river basin and concluded that the Martin's Brook sub-basin is stressed, as the Commission defines it.

North Reading responded that the brook scored well on a habitat assessment by USGS and that DEP, when it published the "Ipswich River Watershed 2000 Water Quality Assessment Report"in 2000, did not mention that Martin's Brook was flow-impaired when discussing conditions there. The town objected that Lamonte's work was of little utility because Martin's Brook has no streamflow gauge and thus Lamonte had to use a gauge some distance away in the mainstem of the river. It also objected that Mackin failed to consider some positive impacts on flow in the Martin's Brook sub-basin, such as from septic systems in the sub-basin that are located in Andover and North Andover. Still, its witness John Gall conceded that Martin's Brook is under some stress, although he attributed that stress primarily to withdrawals made by the town of Wilmington, which withdraws three times as much water from the sub-basin as does North Reading.

North Reading maintains that DEP should look solely at whether the town's withdrawals alone are impacting Martin's Brook and not Wilmington's withdrawals as well. I do not see a regulatory basis for this. At the most basic level – safe yield – DEP must condition a withdrawal permit so that a proposed "withdrawal in combination with other registered and permitted withdrawals shall not exceed the safe yield of a water source." 310 CMR 36.28(1)(j). As a consequence, DEP must take into account both North Reading's and Wilmington's withdrawals when considering the impact these withdrawals have on the Martin's Brook sub-basin.

groundwater in the sub-basin during the summer to feed the brook's flow.

The connection between the streamflow triggers and flow in Martin's Brook is not quite so obvious. Limiting lawn watering and other "non-essential" uses by North Reading's customers when flow drops in the Ipswich River will not necessarily cause the town to withdraw less water from the Martin's Brook sub-basin. It may simply reduce its purchases of water from Andover – an option the town says it will exercise – in which case imposing the condition will not benefit the brook. Moreover, the condition is tied to flows in the mainstem of the river, not to flows in Martin's Brook. As North Reading pointed out, USGS data on flow in the mainstem and the tributaries in the summers of 1988 and 1999 shows at least occasional disconnects. There was flow, for example, in Martin's Brook on July 20, 1999, but none at a riffle just below the South Middleton dam, which is downstream of Martin's Brook. In such an instance, flow levels in the mainstem would trigger a requirement that North Reading residents limit their use of water at a time when Martin's Brook may not necessarily need the help.

But it is well to remember, when considering the impacts of the conditions in the modified permit, that DEP's authority to issue the permit derives ultimately from its statutory responsibility to establish "a mechanism for managing ground and surface water in the Commonwealth as a single hydrological system." M.G.L. c.21G, §3. One of the ways the Water Withdrawal Regulations implement this directive is by focusing on the "water source" from which a withdrawal is made. See 310 CMR 36.03 (definition of water source). In this instance the water source is the Ipswich River basin. Consistent with its responsibility to look at the overall impact of withdrawals on the water source, the plan DEP put in place to address this round of permit modifications focuses on impacts to the Ipswich River basin overall, with some

variations depending on factors related to the particular impact a community's withdrawals likely will have on the river. Having concluded that the basin is oversubscribed and that groundwater withdrawals contribute to low flows in the river, DEP could, as it appears to have done, decide that in order to improve overall conditions in the river all water withdrawers in the basin must take additional steps to conserve water, even if when viewed in isolation, a particular community may have a net positive impact on the river.

The overall positive impact on the river associated with North Reading's purchase of water from Andover does not make DEP's streamflow trigger approach unreasonable. That positive effect comes from the slow percolation of water from residential septic tanks into groundwater throughout North Reading, which ultimately benefits the river. But DEP could conclude that when flow in the mainstem is low, it then becomes appropriate to implement conservation measures meant to address the low flow. In North Reading's case, because its wells are by and large near a tributary of the river, a reduction in nonessential water uses when the river is low could lead to an overall reduction in water use and thus to a possible reduction in pumping from town wells, which would provide a quick benefit to flow both in the tributary and in the mainstem. That the town may choose to first reduce purchase of water from Andover in response to the implementation of the water conservation measures necessitated by a streamflow trigger having been met does not make it unreasonable to think that some of the reduction in water demand will be matched by reduced pumping – though the specifics of such reduction are ripe for discussion between DEP and the town.

Nor is it necessarily the case that by insisting on the streamflow trigger condition DEP is sacrificing long term benefit to the river. Assuming that implementing this condition will cause

the town to reduce water purchases from Andover does not necessarily mean that much less water will end up in the town's septic systems, water that would otherwise have ultimately found its way to the river. This is because the conservation conditions DEP requires the town to impose on "non-essential" water uses focus on outdoor use, principally lawn watering. None of that water ends up in septic systems, and most is lost through evapotranspiration, and hence does not ultimately benefit river flow.

Because DEP has reasoned bases for the conditions it imposed that take into account both the overall circumstances of the river basin and the impact of North Reading's purchase of water outside the basin, I conclude that the overall positive impact the town has on the water balance in the basin does not make the conditions DEP impose in the modified permit unreasonable.

2. North Reading's Water Conservation Efforts

North Reading also asserts that DEP failed to credit it for other positive contributions it makes to the basin. Town residents not only by and large put wastewater back into the basin through septic systems, but according to David Hanlon, the director of the town's Public Works Department, in the areas of town that cannot support septic systems, the town is exploring means to install public sewers that will discharge clean water back into the basin. He also testified that North Reading is implementing a storm water management program designed to eliminate pollution runoff into surface waters and groundwater recharge areas, an effort that goes beyond what is required by the federal Clean Water Act. In addition, the town has spent ten million dollars to acquire over 100 acres along the Ipswich River and dedicate it as conservation land. It is working with the Division of Fisheries and Wildlife to distribute rain barrels and it is working to enhance the soil on its playing fields so that the fields will require less watering. It is also

conducting a pilot program to assess the effectiveness of using roof runoff as an irrigation alternative. It performs leak detection annually and it has enacted a bylaw that establishes a odd/even watering schedule throughout the town. From North Reading's perspective, DEP, aside from praising the town's wastewater treatment efforts, not only failed to credit the town's conservation efforts, but without reason imposed more stringent conditions than it did in other communities.

As I stated earlier, DEP placed North Reading in a category of the communities in the Ipswich River basins on which it imposed the fewest new conditions. Given the information DEP obtained from the USGS studies, it was not unreasonable for DEP to require all communities to adhere to a set of standard water conservation conditions that are more stringent than those imposed in the past, even communities such as North Reading that have made extensive and varied efforts to conserve water.

As for the town's claim that it is being treated more harshly that other communities, that claim relates to the manner in which DEP calculated the summer cap. I turn now to this and other specific conditions to which North Reading objects.

II. North Reading's Objections to Permit Conditions

A. Summer Cap

The modified permit requires that North Reading average no more than 0.52 mgd in withdrawals from its wells during the months of May through September. North Reading contends this cap is unfairly more onerous than caps imposed on other towns, improperly focuses on outdoor water use, and is unachievable.

The town points out that the summer caps imposed by DEP in many other communities in the Ipswich River basin were at or near the average daily water withdrawals allowed under the total water allocations in these communities, while North Reading's cap is around half its allocation. This is of no particular consequence. DEP, in trying to determine what conservation measures to impose, examined actual water usage rather than theoretical withdrawal rights. The caps it imposed in each of the instances cited by North Reading relate to the actual water withdrawals in each community, some of which presently use water at rates that approach the total volume of water allocated to the community. This is not the case with North Reading. In the four years considered by DEP for purposes of determining the summer cap, the town averaged 0.58 mgd of withdrawals from its wells during the year, far less than the 1.11 mgd it is allocated. What North Reading did not note is that in each of the communities it cited, DEP requires the community to decrease its actual water withdrawals during the summer. Thus, on this score, DEP did not treat North Reading unfairly.

North Reading claims that the summer cap improperly focuses on lawn watering and other "non-essential" uses. As the town sees it, DEP's obligation under the Water Management Act is to achieve a balance among all competing water uses, not to make judgments derogating one particular kind of use.

I reject this argument – and apparently so do the town's witnesses. The mandate in the Act and the Regulations to consider water conservation implies that some water uses are not as valuable as others and should be limited so that the water resource can be used for more important purposes, whether that involves water withdrawn for necessary uses or water left in the aquifer to keep the river at a level that will promote fish habitat or recreation. Mark Clark, the

North Reading Water Superintendent, in responding to the order to complete, recognized that DEP's desire to limit non-essential water uses was valid. He stated that the "North Reading Water Department recognizes seasonal water use, primarily resulting from residential lawn watering, as a concern and an issue that needs to be addressed." Indeed, to some extent, the town has already attempted to address lawn watering by passing a bylaw that limits watering to even or odd days depending on whether the street number of a house is even or odd. If the town really believed that DEP could not seek to limit lawn watering in the modified permit, then I fail to see how the town's bylaw could be legitimate either – a position that no party takes.

The town's claim that the 0.52 mgd limit set by the summer cap is unattainable is based in part on a contention that it would have difficulty purchasing enough water in the summer to meet the needs of its customers in excess of the volume it would be allowed to withdraw from its own wells. The town also contends that, in comparison to other communities, the cap represents an unfairly large reduction from its current typical summer use.

The method DEP used to determine the cap for North Reading is a variant of the method it used for the other communities in the Ipswich River basin. For each of these other communities, DEP looked at water usage in the four years from 1999 through 2002. It then calculated the average difference in each community between its typical winter water usage during those years and its typical summer usage. It determined that the average difference by which summer usage exceeded winter usage was 1.4 to 1. For those communities whose ratio was above this average, DEP required them to reduce their summer water usage by 50 percent of the difference between their summer and winter water usage. For communities whose ratio was below this average, DEP required them to reduce summer water usage by only 25 percent of the

same differential. DEP calculated the exact cap number by looking to the year between 1999 and 2002 in which the difference between summer and winter usage was at its highest, which would typically be a year in which the community withdrew a higher than normal volume of water in the summer, and then determined by how much that high number should be reduced. DEP's goal, according to Lamonte, was to come up with a number that would achieve real water savings and be achievable by the community.

With communities that do not import water, there is no substantial difference between that amount of water pumped and the amount of water used by the customers of the town water supplier. That is not the case with North Reading. There, town water usage rises significantly in the summer, but the town withdraws water from its wells in the Ipswich River basin at a relatively constant rate year-round, while making up for the increase in summer demand by purchasing more water from Andover.

As a consequence, DEP had to make some choices when it tried to rework its summer cap calculation method to account for North Reading's situation and still come up with an achievable reduction in summer water usage. Because the town uses 50 percent more water in the summer than the winter, DEP concluded that the town needs to conserve water. Aside from North Reading's objection to DEP's focus on nonessential water usages, the town does not contest this conclusion. Having decided to impose a summer cap, DEP then had to decide whether to base its calculations on the total overall water use by the town or on water withdrawals from the Ipswich River basin only. Because it is the level of overall use that rises in the summer, DEP chose to consider that figure in determining the percentage by which use would have to decline. However, because the purpose of the summer cap is to limit impacts on the Ipswich River, DEP

decided that the cap itself should be only on the town's withdrawals from the basin, and not on its overall use.

North Reading objects to DEP's reliance on overall withdrawals to determine the difference between summer and winter water use because the permit concerns only Ipswich River basin withdrawals. As the town sees it, the relationship between its summer and winter withdrawals from its own wells is 1.04/1, and as a consequence, DEP should have based its summer cap on a reduction in use of 25, not 50, percent.

That the formula DEP used in part relies on water North Reading obtained from outside the Ipswich River basin is not troubling because the resulting cap number applies exclusively to town withdrawals from within the basin. In any event, because the difference between the town's summer and winter water usage is so small, whether the formula DEP used called for a 50 percent or a 25 percent reduction would have made little difference in the cap number.

What did make a difference was the year on which DEP chose to base the cap. That year, 1999, was the year in which the percentage difference in the town's overall summer water use and winter use was the greatest in the period between 1999 and 2002. But, it was also the year in which the town's withdrawals from its wells were at the lowest for this period during both the

summer and winter seasons.[14] As Thomas Lamonte, who calculated the summer cap, testified, the town in 1999 averaged 0.524 mgd in water withdrawals during the winter that year and 0.526 mgd during the summer, but averaged 0.58 mgd during the entire four year period. Because the town's water withdrawals were so low that year, the cap number it ended up with, 0.52 mgd, was also low.

North Reading contends that 1999 was an anomalous year. It had to take one of its wells off-line for the summer because its was constructing a new water treatment plant, causing it to withdraw less water than usual. Clark testified that the town otherwise averaged 0.83 mgd in withdrawals for the period between 1990 and 2003. Gall used this data to come up with an alternative proposed summer cap of 0.70 mgd.

I reject the town's proposed cap. It exceeds most summertime withdrawals by the town in more recent years and it is at or near the town's realistic pumping capacity, which is limited by the physical condition of the town's wells and water quality problems. It would not achieve any conservation whatsoever, and thus not would not meet DEP's reasonable goal of reducing summer water withdrawals by an achievable amount.

---

[14] The figures for water withdrawals by North Reading from its wells in the Ipswich River basins during the summers and winters of 1999 through 2002 are shown in the following table, which is based on monthly water withdrawal data North Reading included in its annual reports to DEP.

Year	Winter (Nov.-Mar.)	Summer (May-Oct.)
1999	.5237 mgd	.5256 mgd
2000	.5592 mgd	.5407 mgd
2001	.5803 mgd	.7430 mgd
2002	.5883 mgd	.5364 mgd

But North Reading has a point, nonetheless. By basing the cap on a year in which the town's water withdrawals from its wells were low year-round, in part because of changes it was making in its water supply system, the cap DEP set is quite low. The 0.52 mgd cap is in fact not only lower than water usage by North Reading during the summers of 1999 - 2002, but in each winter of the same period.

As I noted earlier in describing DEP's typical method for calculating the summer cap, DEP usually based the cap on a year in which overall summer usage was high, and thus the cap would represent an achievable reduction from a problematic high water use year. If, instead of looking at North Reading's combined use of water from the Ipswich and Merrimack River basins, the focus were shifted to North Reading's use of water from its own Ipswich River basin wells, the year used to make the cap calculation would change. During the four year period DEP considered when calculating the summer cap, the greatest difference in well withdrawals between summer and winter by North Reading occurred in 2001. That winter, the town averaged 0.58 mgd in water withdrawals, a figure that rose to 0.74 mgd during the summer.[15] A 50 percent reduction in the difference between summer and winter usage that year would result in a cap number of 0.66 mgd.

This method is, to some extent, closer to the method DEP used to calculate the summer cap for other communities. However, it does not lead to a figure that achieves DEP's goal of an achievable reduction in summer use. The number is simply too easy to achieve. In each of the

---

[15] See table at footnote 14. Clark testified that the town was rehabilitating its storage wells in 2000 and 2001, leading to less withdrawals during those years because the town was unable to store the water. But of the four years DEP considered in calculating the summer cap, 2001 represented the most summertime withdrawals by a wide margin.

other three years DEP considered in calculating the cap, summertime water withdrawals were well below that figure.

The data for the four year period presents other anomalies as well. In two of the four years, average winter withdrawals exceeded average summer withdrawals. When presented with such an unusual assortment of data, I conclude that the most sensible way to determine a cap figure that represents a realistic reduction in summer versus winter withdrawals is to consider the average withdrawals for the entire period. Such a method will even out some of the oddities in the data.

During the period from 1999 through 2002, North Reading withdrew on average 0.56 mgd in the winter and 0.59 mgd in the summer. A 50 percent reduction in the difference between these two figures would lead to a summer cap number of 0.575 mgd. This is realistic, as North Reading has already shown that it can reduce its withdrawals to this level, and it represents an actual reduction from typical summer withdrawals made by the town. I therefore recommend this minor change in the summer cap figure.[16]

B. Streamflow Triggers

North Reading objects to the modified permit's requirement that it impose mandatory watering restrictions when flow in the Ipswich as measured at the South Middleton gauge falls below 0.42 cfsm for three consecutive days. The town contends that (1) flows below 0.42 cfsm are within the natural flow of a low gradient river like the Ipswich River, (2) watering limits based on a flow rate that occurs repeatedly at a gauge downstream of the town is unrepresentative

[16] The summer cap is stated in Condition 6 of the modified permit both as 0.52 mgd and as 79.56 million gallons total over the course of the 153 day period DEP from May 1 to September 30. At 0.575 mgd, the total cap for this period would be 87.975 million gallons.

of conditions in Martin's Brook and is oppressive, and (3) watering limits that will effectively limit only water purchases from Andover are unrelated to conditions in the Ipswich River basin.

I addressed many of these contentions earlier in discussing the town's general objections to DEP's use of the USGS studies. USGS found, unquestionably, that under natural conditions flow in the Ipswich River falls below 0.42 cfsm 27 percent of the time. But the USGS Aquatic Habitat Study's recommendation that restoration of adequate habitat should be tied to a minimum streamflow of 0.42 cfsm cannot be read sensibly as meaning that the Study's authors hoped that reductions in water withdrawals could achieve streamflow levels higher than those naturally occurring. Rather, the 0.42 cfsm figure in the Aquatic Habitat Study refers to an average flow goal. DEP used that number simply as an indicator that flow in the river is falling below a level tied to habitat stress. At that point, DEP requires communities to restrict water usage in an effort to alleviate that stress on the river.

That flow in the river will fall below 0.42 cfsm frequently in the summer and routinely from summer to summer does not by itself make the condition unwarranted. DEP has reason to conclude, based on the Aquatic Habitat Study, that river habitat improvement can be advanced by limiting water withdrawals when flow falls below 0.42 cfsm. The net result may be that North Reading (and other communities in the Ipswich River basin) will have to impose watering restrictions during some period of most summers. But DEP has established a justification for such watering limits.

The location of the gauge is not problematic either. As noted before, DEP's principal concern is with flow in the river as a whole. While much of the testimony focused upon the impact of the town's withdrawals on Martin's Brook from whose watershed the town withdraws

water, tying watering restrictions to flow in the river serves DEP's main purpose of improving flow in the Ipswich River generally. Of course, in the case of North Reading, that depends in large part on whether reductions in water use caused by mandatory watering restrictions will in turn reduce pumping from town wells, rather than merely reducing the town's purchase of water from Andover. While it is likely that the town will first reduce the added expense of water purchases from Andover in response to a decline in demand occasioned by adherence to the watering restrictions, it was not unreasonable for DEP to adopt an approach that would lead to an overall reduction in water demand during high stress periods in the river. With water demand reduced, the town may respond by reducing to some degree the volume of water it pumps from its wells. Similarly, a step that will routinely reduce overall summer water demand will make it more likely that the town can comply with the summer cap.

C. Growth, Water Rates, and Pumping Problems

North Reading maintains that, to the contrary, it will have difficulty operating its water supply system in compliance with the summer cap and the streamflow triggers, and that, were it to comply with these two conditions, town water rates would increase, which would in turn diminish land values and inhibit growth. It argues further that the town is growing substantially, that it cannot accommodate this growth within the strictures of the cap and the streamflow triggers, and that DEP failed to consider this growth when it issued the modified permit.

North Reading alleges that if it has to reduce water usage to 0.52 mgd in the summer, it may be unable on occasion to purchase enough extra water from Andover to meet peak demand. Although it may purchase more than the 1.5 mgd average figure that its contract with Andover specifies, it has agreed not to purchase more than 1.7 million gallons on any given day because

purchases in excess of this volume cause water pressure problems in Andover. North Reading frequently purchases at or near the 1.7 million gallon figure now. It is concerned that on days when it is making maximum use of the water it purchases from Andover, it may not be permitted to withdraw enough water from its own wells to meet the total demand for water.

The town asserts as well that if mandatory watering restrictions are imposed as a consequence of reduced flow in the Ipswich River, it will have to limit watering to a few hours in the morning and the evening, which will cause it operational problems in the morning because of heavy demand by customers who are watering their lawns and taking showers before they go to work.

While these sorts of operational limits are significant, the record hardly demonstrates that North Reading cannot operate its system in a manner that complies with the summer cap or the streamflow triggers. The water use data in the record shows that in a number of recent summers, North Reading's withdrawals from its wells were near either the 0.52 mgd cap level stated in the modified permit or the 0.575 mgd cap I have recommended. There is no evidence that the water supply system failed in any of those years or on any peak use days in those years – some of which were years in which the town was operating without one its wells or with less storage capacity than usual. Furthermore, the cap is an average number, so that on a day on which the town needs more water than the cap number plus 1.7 million gallons, it may exceed the cap figure so long as it meets the cap on a summer-long basis.

As for the impact of the mandatory watering restrictions that must be imposed if streamflow falls below 0.42 cfsm, DEP requires not only that watering be limited to the early morning and the evening, but also that watering be done with hand-held hoses and without

sprinklers. Whatever difficulties North Reading experienced when simply applying hourly restrictions on lawn watering does not necessarily bear on what would happen if residents were limited as well to watering with hand-held hoses. Finally, the effect of the cap and the streamflow triggers will most likely be to reduce summertime water use, making the town's water supply crisis scenarios less likely.

But to the extent the cap and the streamflow trigger cause water use reductions, North Reading asserts it will have to raise water rates that are already among the highest in the region. Clark testified that the net result of having to spread the water supply system's fixed costs among its customers who will be purchasing less water along with the purchase of a higher percentage of pricier water from Andover (because of the withdrawal limit the cap entails) will be that the town must increase water rates by approximately 15 percent. The town argues that this will diminish land values because it will make large, grassed lots less attractive to purchasers.

Lastly, the town argues that DEP failed to meet its Water Management Act obligation to consider the consequences of its proposed conditions on land value and growth. North Reading asserts that it is growing at a relatively rapid rate. Because communities around it are built out, it has become a focus of growth. According to David Hanlon, the Director of the North Reading Public Works Department, the town has been granting 50 to 60 building permits per year for single family houses, mostly for large homes on two-acre lots. It is also experiencing growth in affordable housing, known as Chapter 40B projects. It expects that 500 affordable units will be built within the life of the permit, resulting in an increase in water demand of 0.15 mgd.

Turning to the water rate contention first, I note that the Ipswich Watershed Association contends that DEP is not required to analyze the effect of water conservation conditions on water

rates. While there is no mention of water rates among the factors listed in the Water Management Act that DEP must consider when permitting water withdrawals, the Act's extensive list of the factors to be considered suggests that the legislature intended that DEP take a broad view of the impact of water withdrawals and conditions imposed upon them. See M.G.L. c. 21G, § 7. DEP did, in fact, consider the impact of its conditions on water rates when it decided to impose a condition addressing private irrigation wells. Hence, I will examine the town's water rate contentions.

That conservation measures will cause water rates to rise because fixed costs must be spread over fewer gallons of water used would seem to be true of every situation in which a town conserves water. But that does not necessarily mean that the higher rate will result in a higher bill for the typical customer. Although the rate per gallon may rise, if the total volume of water used decreases, there may be no change in the water bill.

North Reading offered little evidence to support its position that an increase in water prices would diminish property values. On cross-examination, DEP witness Thomas Lamonte acknowledged that he had received "negative phone calls from people in communities who have water restrictions, telling me they're moving, they're getting out of town because their property values are falling because of lack of water." That someone, somewhere might have moved because of unspecified watering restrictions (not water rates) is hardly compelling proof of what will happen to land values in North Reading if water rates rise and watering restrictions are imposed. Indeed, it is not evidence of that at all. The most pertinent testimony on the impact of water rates on North Reading's customers is that its largest residential water users, who pay a higher rate for using more water, have readily absorbed that added expense so far – to the point

where, according to Clark, some customers pay $1,000 water bills during the billing quarter that includes the summer.[17]

As for the impact of permit conditions on land values, there is no question that under both the Water Management Act and the Water Withdrawal Regulations, DEP must consider land values as a factor in its permitting decisions. But what it must specifically consider is the "reasonable protection of ... land values" that are dependent on existing water withdrawals. 310 CMR 36.26(1)(d). If the value of a large lot is dependent on expending $1,000 to water it during the summer, is DEP obligated to structure its permit conditions so that this level of watering can continue unabated? DEP has no regulatory obligation, in the face of evidence obtained from the USGS studies showing that water must be conserved, to refrain from imposing conditions that would require such high volume water users to cut back. Reasonable protection of land values does not encompass maintaining a status quo that involves such high volume lawn watering.

The Regulations also require DEP to consider the impact of a proposed water withdrawal on "reasonable economic development." 310 CMR 36.26(1)(j). By implication then, DEP must also consider the impact of water conservation measures on reasonable economic development.

I reject the town's contention that DEP failed to do so. When DEP issued its order to complete to North Reading, it asked the town whether it could meet water demand if its permitted volume were held to 0.15 mgd, and, if not, to provide a detailed explanation of projected demand increase. It also asked the town to comment on a projected reduction in summer water usage of 20 percent and on tying watering restrictions to streamflow.

Clark responded that the town had no objection to maintaining the permitted volume at

---

[17] According to Clark, the typical North Reading water customer pays $547 annually for water.

0.15 mgd. He stated that the town had "experiencing significant growth since 1999, including approximately 1% per year growth on the residential side," a growth rate that he identified elsewhere as involving 45 new residences per year. He also stated that Teradyne, the town's largest commercial industrial water user, had recently connected to the water supply. The Teradyne facility was then using water at a rate of 15 million gallons per year. Clark projected that new office space and rental of existing unoccupied office space would add new demand of 0.095 mgd to the system.

Despite this actual and projected growth in demand, Clark did not opine that cutbacks in summer usage or watering limits tied to streamflows were unworkable. Rather, he stated that streamflow limits listed by DEP were too restrictive and placed too much emphasis on restoring aquatic habitat and that DEP's projected 20 percent decrease in summer use would be hard to achieve given growth in demand for water in the town. According to Clark, a reduction of the magnitude of 20 percent in summer water use "could be targeted as a goal, but the level of growth since 1999 – and anticipated in the future – will make this goal difficult to achieve."

As the order to complete and the town's response show, DEP asked for and obtained information from the town about growth in the town and growth in demand for water. DEP responded to the objection of Clark and officials in other towns to its proposal to require an across-the-board 20 percent reduction in summer usage by adopting a community-specific summer cap instead. Hence, the evidence establishes that DEP did consider growth in its decision-making process.

Whether its decision adequately accounts for reasonable growth is another matter. Although DEP changed its summer cap calculation method, the cap number it imposed in the

permit and the streamflow triggers imposed as well were no doubt more restrictive than Clark or the town thought they should be when Clark responded to the order to complete. The evidence the town submitted at the hearing, based on information about new Chapter 40B housing proposal that was presented after Clark's 2003 response to the order to complete, shows that the town is growing faster than he anticipated.

I conclude that the permit accommodates reasonable growth, even in light of this new information. I note at the outset that no question was raised at the hearing about whether the pace of growth in North Reading is reasonable. I note as well that the statutory and regulatory mandate that DEP factor in reasonable growth when it makes permitting decisions must include an accommodation to state policy expressed in Chapter 40B encouraging the construction of affordable housing throughout the Commonwealth.

The simplest way to examine whether North Reading can accommodate the more rapid growth its witnesses testified to at the hearing is to examine the most recent evidence concerning its water use. These are the annual reports the town filed for the years 2003 and 2004. In 2003, North Reading used an average of 1.39 mgd throughout the year; 0.66 mgd of this volume came from the town's Ipswich River basin wells. The following year, the town's total average use was 1.33 mgd, with 0.53 mgd coming from town wells. Thus, in the most recent years for which data was available at the time of the hearing, the town's water use was well below the 2.61 mgd total volume of water available to it from both its Ipswich River basin and Merrimack River basin sources. The annual average volume of water it pumped from its wells was also well below the 1.11 mgd it could theoretically pump based on its total allocation of registered and permitted water withdrawals.

But could it, with growth, accommodate new water users and still abide by the summer water restrictions contained in the modified permit? The data suggest that it can. In 2003, North Reading's average total water use during the summer was 1.65 mgd, 0.70 mgd of that coming from the town's wells. In 2004, the town's average summer water use was 1.58 mgd, with 0.58 mgd coming from its wells. The total water usage in each year was considerably below the average daily maximum of 2.61 mgd theoretically available to the town throughout the year. In addition, summer water use was below the maximum the town says it could withdraw based on the practical limits of its ability to pump water from Andover (1.7 mgd) plus the cap limit (either the 0.52 mgd in the modified permit or the 0.575 mgd I recommend). What is more, while the town in 2003 withdrew well water in the summer at a rate that exceeded what would have been the cap figure, it came much closer to meeting the cap in 2004. Because total water use did not vary much between these two summers, I conclude that the town's ability to meet the cap depends largely upon the choices made by its Water Department as to what balance to maintain between the town's two water sources.

To the extent North Reading has demonstrated that it will experience a growth in demand for water, that growth will be in basic water usage throughout the year, while the conditions DEP would impose will reduce non-essential water use during the summer. Considering that in the four years prior to the issuance of the modified permit the town's water use rose 50 percent on average during the summer, there appears to be room for the town to cut back on the rise in summer water usage without cutting back on essential water use, even as it grows. The town's own evidence suggests as much. Clark reported in response to the order to complete that after August water bills are sent out, the shock of paying for the highest priced quarter of the year

correlated with an immediate decline in water use of as much as 20 percent. Thus, I conclude that the evidence shows that the summer cap and the streamflow triggers will not impermissibly interfere with the growth the town projects.

D. Private Well Regulation

The final condition that North Reading challenges is the one requiring that it either impose the same summer watering limits on residents of North Reading who draw water from private irrigation wells or, failing that, impose a total watering ban on public water supply customers if flow in the Ipswich River at the South Middleton gauge falls below 0.42 cfsm for three consecutive days. North Reading contends that there is no evidence that private wells actually reduce groundwater levels and thus impact river flow, and hence there is no basis for requiring local regulation of private wells. Furthermore, the town maintains that to the extent DEP is forcing it to choose between regulating private wells or further restricting water use by the town's water supply customers, there must be some evidence that the two alternatives would provide comparable environmental benefits. It asserts that there is no evidence of comparability that would justify a draconian ban on all outdoor watering when flow in the Ipswich River decreases.

I reject North Reading's challenge to this condition. The town's initial basis for challenging the private well condition was that it exceeded DEP's authority. Prior to the hearing, I rejected that contention, but gave the town an opportunity to present at the hearing any fact-based contentions that the town had about the condition. Ruling on Legal Issues, 11 DEPR 49 (March 25, 2004). The testimony that the town submitted presented few facts relevant to the arguments it now makes, an argument on which it had the burden of going forward. Its witnesses

did not assert that private wells draw water from a source that had no impact on groundwater or river flow. Rather, Clark testified that private wells in town are typically farther away from the Ipswich River or Martin's Brook than the town's water supply wells and hence their impact on the river is more attenuated. Nor did the town's witnesses testify to the differing impacts of regulating private wells and imposing a watering ban applicable to public watering supply customers. Given the dearth of evidence presented by the town, it is not surprising that DEP's witnesses failed to submit testimony about the private well condition for DEP would have no reason to respond to factual arguments that were not presented.

What evidence there is in the record tends to support DEP's position. There are approximately 200 private irrigation wells in North Reading, and 19 new wells were added in 2003-04. Much of the new single family development in town is on two acre lots. Customers with homes on these new lots use more water typically than do customers in older homes on smaller lots. Although some customers have been willing to accept high water bills for summer lawn watering on these large lots, the evidence also shows that town residents are responsive to the price of water. At some price, a homeowner who wants to continue watering a large lot will find that the expense of installing a private well is worth it to avoid the high cost of paying for town water. Absent limits on watering by residents with private wells, more private wells can be expected to be installed in North Reading in response to the watering restrictions imposed by the modified water withdrawal permit and the anticipated higher water rates the town believes will be associated with the modified permit. Even if these private wells are farther away from the river and from Martin's Brook than the town's water supply wells, any water withdrawn from the wells and not returned to the basin will necessarily impact groundwater levels and the

groundwater flow that feeds the river, although it will take longer for withdrawals from private wells to affect river flow than will withdrawals from the town's wells. As the parties all agree that septic system flow adds water to the basin and ultimately helps river flow, it would appear to follow that private wells potentially have the opposite impact on river flow. Thus, DEP has a rational basis for concluding that regulation of private wells is connected to its overall water conservation goal, and that absent limits on private well use, more conservation limits would have to be imposed on public water users to make up the difference.

A total watering ban on all the town's water supply customers when river flow drops is likely to be far more restrictive than requiring the few private well users to adhere to the watering restrictions contained in the modified permit. However, the town cites no provision in the Regulations that would require that when DEP presents two possible options to a community, the consequences of each option must be similar. There is no question that DEP would prefer that North Reading regulate private well users, and there is no apparent regulatory reason why it cannot craft a condition that would steer the town in this direction.

III. Intervenors' Objections to Permit Conditions

A. Water Bank

Where North Reading sees the modified permit as imposing conditions that are unjustified, Intervenors contend the conditions DEP imposed do not go as far as they should. Intervenors maintain that low flows in the Ipswich River demonstrate the inadequacy of the present water withdrawal status quo in which river habitat is not what it should be, even though the communities in the basin are not withdrawing all the water they are allocated. Growth can only make this situation worse, a situation Intervenors would remedy by having the modified

permit impose a "water bank" on North Reading now.

As it is, the modified permit would require that North Reading establish a water bank in any year after it exceeds its total water allocation. The town would then have to come up with a plan to address growth in water demand by achieving two gallons in savings for every new gallon of demand. But given North Reading's current water usage, which averages 0.58 mgd from its Ipswich sources, the chances are extremely remote that it will exceed its allocation of 1.11 mgd in any year during the term of the modified permit. Intervenors urge that growth in water demand be addressed now with a water bank.

There is evidence in the record that North Reading will experience growth during the six year term of the modified permit that will increase water demand in the community. According to town Water Superintendent Mark Clark, 45 new private houses will be built each year, which represents a one percent annual growth rate in the town's housing stock.[18] He estimates that this will add 0.062 mgd in new water demand over the term of the permit. The town also estimates that 500 units of affordable housing will be built during the term of the modified permit and that these units will increase water demand overall by 0.15 mgd. Furthermore, Clark projects that the town will add 0.095 mgd in new water use from industrial and commercial development. Thus, the expected overall increase in water demand may add about 0.31 mgd in water use by the end of the permit period.[19]

---

[18] David Hanlon, the Director of the Public Works Department, testified that 50 to 60 home building permits were being issued annually by North Reading. The data submitted by Hanlon shows some variation above and below those numbers. Therefore, to be conservative, I am using Clark's projection.

[19] The figure the town uses for expected rise in residential water use is in one sense high. If 500 additional units of low income housing are expected to add 0.15 mgd in new water demand, that works

With current annual demand varying from a low of 430 mg in 2000 to a high of 525.5 mg in 2001, which works out to 1.17 mgd in 2000 and 1.44 mgd in 2001, the addition of 0.31 mgd in water usage would increase overall water demand in North Reading between 21.5 percent and 26.5 percent by the end of the permit period. The change is even more dramatic if only the 0.58 mgd the town typically withdraws from its Ipswich River basin wells is considered. The additional 0.31 mgd is 53 percent of that figure.

While North Reading is concerned about how to meet the growth in water demand, it hardly agrees with Intervenors that a water bank is the answer. It maintains that it will address growth by simply purchasing more water from Andover. Indeed, Mark Clark testified that the town has not developed any water conservation response specifically meant to address growth.

North Reading's answer is hardly satisfactory, even from its own perspective. As the town pointed out, the more it relies on Andover water, the higher the water rate it must charge its customers. And it can realistically obtain only 1.7 mgd from Andover, which it claims may not be enough on days of peak summer demand given the limits the modified permit places on use of the water it obtains from its Ipswich River basin sources.

A water bank designed to save two gallons of water for every additional new gallon of

---

out to 300 gallons per day for each unit. If four people live in a unit and those people adhere to the modified permit's limit of 65 gallons per person per day (a figure that town water users have rarely achieved), the total water use for the unit would be only 250 gallons per day.

On the other hand, if 45 new private houses are built per year during the six year permit period and if those houses will cause water demand to rise by 0.062 mgd, then the 270 total new houses will use only 229 gallons of water per day, a figure lower than the estimate of water use by the new low income houses. But, the evidence establishes that new single family houses will be built on large lots and use more water than is typical, suggesting the estimate may be low to the extent it applies to new private housing. Assuming for present purposes that these two problems with the estimate cancel each other out, I accept 0.212 mgd as the most likely estimate of the ultimate rise in residential water use in North Reading during the permit period.

demand would not only achieve water conservation, but make it easier for the town to accommodate new growth within the strictures imposed on its Ipswich River basin and Merrimack River basin sources. Intervenors say that the details of a water bank should be left up to the town to design. But they propose that the town consider Weymouth's water bank as a model. Weymouth imposes a fee on new construction and uses the money raised to fund efforts to reduce water consumption in the town. Intervenors note that North Reading has many older homes, whose owners could save on water if the homes were retrofitted with modern, water-saving appliances. For a time, the town ran a program designed to encourage its residents to install low-flow shower heads, but it abandoned the program some years ago. A reinvigorated retrofitting program, as suggested by Intervenors, might promote real water savings and thereby make it easier for the town to grow and to achieve the water conservation mandated by the modified permit.

But it is difficult to say whether a water bank is necessary to achieve the benefits to the Ipswich River DEP is seeking by way of the permit modification. DEP's permit modification focuses on non-essential water use; by reducing such use it hopes to reduce the amount of water withdrawn from the basin and thereby improve flow in the river. In another community in which the growth in essential water demand had the potential to wipe out the water savings that would likely be achieved by the permit conditions limiting non-essential water use, I recommended that a water bank be imposed before the community reached its water allocation if growth in water service connections exceeded two percent per year, a recommendation the DEP Commissioner accepted. See Matter of Town of Hamilton, Docket No. 2003-065, Recommended Final Decision, 13 DEPR 3, 11-12 (Mass. Div. of Admin. Law Appeals, Jan. 19, 2006), adopted by Final

Decision, 13 DEPR 98 (Mass. Dep't. of Envt'l Prot., Mar. 26, 2006)(Town of Topsfield permit). In North Reading it is not so clear what effect growth in overall water demand will have on use by the town of its Ipswich River basin wells or, thus, what impact growth in water demand will have on the river.

The one condition DEP imposed that is directly tied to town well withdrawal is the summer cap. Whether it is the cap listed in the modified permit (0.52 mgd) or the cap I have recommended (0.575 mgd), the cap rate of water withdrawal is a modest reduction from the town's typical recent withdrawals from its wells (0.58 mgd). The average volume of water saved by this measure will be between 0.06 mgd and 0.025 mgd, well below the projected 0.31 mgd growth in water withdrawal volume anticipated by the end of the permit period.

While this divergence would under most circumstances raise a warning flag, that is not so obviously the case when the town will attempt to address growth in water demand, not by increasing withdrawals from its own wells, but rather by purchasing more water from Andover. Intervenors assert that the town's preexisting arrangement to purchase water from outside the basin should not redound to its benefit from a water bank perspective as it is not a response to new growth in water demand. None of the parties argued for that the town's purchase of water from Andover should be treated as if it were an addition to a water bank. Still, for purposes of determining which conditions to impose on North Reading in the modified permit, DEP credited the town's purchase of water from outside the basin and therefore imposed conditions typical of the communities with the least impact on the basin – a categorization to which the Intervenors do not object. If the positive impact North Reading's importing of water has on the Ipswich River basin can be considered for some purposes in developing permit conditions, I can see no reason

why it may not be considered when trying to determine whether a water bank is necessary to address growth in water demand – even if it would be improper to consider such use as a credit toward a water bank. If North Reading responds to growth by increasing its purchase of water from Andover, that will reduce the potential strain on its Ipswich River basin sources that would otherwise have occurred. And without an explicit tie between the water bank Intervenors propose and withdrawal of water from the Ipswich River basin, evidence is lacking to demonstrate that immediate imposition of a water bank is necessary to aid flow in the Ipswich River.

Moreover, while North Reading has not specifically adopted water conservation meant to address growth in water demand, it has adopted a number of water conservation measures. While some are as simple as distributing rain barrels, the town is also exploring means to install public sewers that will discharge clean water back into the basin. It is, as well, implementing a storm water management program designed to eliminate pollution runoff into surface waters and groundwater recharge areas, and it has spent ten million dollars to acquire over 100 acres along the Ipswich River and dedicate it as conservation land. Intervenors do not address how these measures should be counted if the town were to establish a water bank. It would be simple enough to determine that the installation of a given number of water-saving devices or rain barrels was likely to reduce water use by 10,000 gallons per day, for example. It is more difficult to calculate the water savings from conserving land along the river or installing sewers that discharge within the basin. Without a better understanding of how conservation efforts by the town should be considered in the water bank context, I am reluctant to require the town to implement a water bank immediately.

Nonetheless, the evidence has established that water use is likely to grow in the town at a

rate of between 3 and 4 percent annually.[20] This level of growth will likely erode some the water savings the permit is designed to achieve. This growth has the distinct potential to strain the town's ability to serve its customers with the water it has and, at the same time, its ability to comply with the conditions in the modified permit.

Some of those conditions will require that the town take steps that will necessarily limit the impact of growth in demand for water. Town residents have fairly consistently used water at a rate higher than the 65 gallons per person per day required by the modified permit. In 2004, they used only 62.4 gallons-per-person-per-day, but in prior years the number of gallons per day was always higher: 70 in 1999, 76.6 in 2002, and 70.8 in 2003. Had residents achieved the 65 gallon per person per day limit, Thomas Lamonte of DEP estimated that 0.06 mgd would have been saved in 1999 and 0.16 mgd would have been saved in 2002. Thus, if the town takes steps that bring residents into compliance with the 65 gallons-per-person-per-day condition, it will achieve water savings that will partially compensate for the projected growth in water demand.

The streamflow trigger condition is also likely to reduce lawn watering in a typical year, thereby providing further compensation for growth in water demand. DEP's witnesses did not estimate how much those savings would be because of the difficulty of calculation. The water savings from compliance with the streamflow triggers may also, on some occasions, duplicate the savings achieved by complying with the 65 gallons-per-person-per-day limit. If a homeowner, for example, reduces lawn watering in compliance with mandatary watering limits triggered by reduced streamflow, the water savings will also factor into the homeowner's compliance with the

---

[20] I calculated the growth rate by comparing the 0.31 mgd estimated growth in water use with the high and low figures for current use: 1.17 mgd in 2000 and 1.44 mgd in 2001. Average growth over the six year period would be 0.051 mgd. That is 4.4 percent of 1.17 mgd and 3.6 percent of 1.44 mgd.

65 gallon-per-person-per-day requirement.

It is not at all clear then that water savings achieved by compliance with the terms of the modified permit will outpace the increase in water demand the town projects. This is problematic because the efficacy of the streamflow trigger condition, for example, depends heavily on whether a reduction in nonessential water use causes a drop in overall water demand and thus creates an opportunity for the town to reduce withdrawals from its Ipswich River basin wells. That will not happen if growth in water use exceeds expected water savings achieved by the watering limits associated with the streamflow triggers. Lamonte calculated that between 1999 and 2002, North Reading used on average 1.55 mgd during the summer months from all its water sources, a 0.51 mgd increase over the winter water use during that period. If the projected growth in water demand were consistent throughout the year (an assumption that is likely true for the additional commercial and industrial water use), then North Reading's water demand on a typical summer day at the end of the permit period would be 1.86 mgd. In order to decrease its demand to the 1.55 mgd level, the town would have to decrease its overall water use in the summer by at least 16 percent. The percentage would probably be even higher because that portion of growth in water use attributable to residences would likely not be evenly distributed throughout the year, but would rise in the summer. As it happens, the 0.31 mgd volume of water that would have to be saved simply to maintain the status quo after the growth in water use anticipated by the town is exactly the same volume that would have had to have been saved if DEP had required a 20 percent cut in overall summer water use from the 1999 summer water use level – a reduction that the town thought unrealistic when it responded to the order to complete.

In light of the considerable increase in water use that growth will cause, the substantial

savings that would have to be achieved in order to reduce pumping in the Ipswich River basin during the summer, and the difficulty the town anticipates from trying to achieve a water savings rate that in the future will do no better than maintain the status quo, I conclude that some further action is called for on the part of the town. This is needed to respond to the anticipated 3 to 4 percent annual growth in water demand so that the town can accommodate the anticipated growth and, at the same time, conserve water sufficiently to achieve DEP's goal of reducing water withdrawals in the Ipswich River basin. To achieve both growth and water conservation, the town must consider what steps it should take to respond to growth that is more than low level. There must, as well, be an ongoing dialogue between the town and DEP about growth in water demand and responses to it. I recommend that the permit be modified to require that North Reading, in its annual report to DEP, identify what growth is anticipated that will exceed 1 percent of existing demand and what steps it intends to take to meet this additional demand and still comply with the conditions of the modified water withdrawal permit.[21]

B: Streamflow Triggers: Levels and Notice

Intervenors seek three changes in the streamflow trigger condition. They request that voluntary watering restrictions be imposed throughout the summer, rather than being tied to streamflow levels, that the streamflow level at which mandatory watering restrictions are imposed

---

[21] Special Condition 1 shall be modified by adding the following after the existing third paragraph:

> In its Annual Statistical Report, North Reading shall state whether demand in the upcoming year for new service connections, development, redevelopment, or expansion of its distribution system will cause demand for water to rise by more than 1 percent above its previous year's total water usage. If it reports that such growth is anticipated, it shall identify what steps it intends to take to meet this new demand and what additional steps it intends to take, if any, to maintain compliance with the terms of this water withdrawal permit.

be raised from 0.42 cfsm to 0.67 cfsm, and that the town be required to communicate to its customers the imposition of watering restrictions more effectively than simply by placing a legal notice in the local newspaper, as the modified permit requires. Intervenors argue that more restrictive streamflow triggers are necessary so that watering use decreases before riverflow falls too far. They advocate 0.67 cfsm because streamflow at that level will provide "good" summer habitat in the river according to one of the flow evaluation methods used by USGS in the Aquatic Habitat Study and because streamflow tends to fall rapidly when it is already this low, and hence time is needed before the river flow recedes to 0.42 cfsm to implement watering restrictions and have those restrictions in turn work to improve flow. To decrease the time it takes to implement watering restrictions, Intervenors argue for a change in the notice requirement because newspaper notice is both slow and potentially confusing. It may be, for example, that by the time notice is published that water supply customers must voluntarily limit water use, flow in the river has already fallen to the level that would require imposition of mandatory watering restrictions.

The modified permit requires that North Reading implement voluntary restrictions on non-essential water use between the beginning of May and the end of September when flow in the Ipswich River falls below 0.56 cfsm at the Middleton gauge for three consecutive days. The permit does not specify what types of restrictions the town should require. Instead, it requires that the town inform its customers that river flow is low, that there is consequently a need to preserve water, and then to offer suggestions to those customers as to how to go about conserving water.

A town bylaw already imposes limits on watering throughout the summer. Residents of even-numbered house may water only on even-numbered days, while residents of odd-numbered houses may water only on odd-numbered days. On its face, the bylaw appears to restrict lawn

watering more than would merely urging water supply customers to limit their water use.

The bylaw was criticized at the hearing as potentially ineffective. Duane Levangie testified that he had heard that under some circumstances odd/even watering restrictions could lead to more watering, presumably because residents would feel compelled to water on the days in which they were allowed to do so, a possibility Mark Clark conceded. DEP argued that because of this problem, the bylaw was not an effective substitute for the mandatory watering restrictions the permit would impose when river flow falls to 0.42 cfsm.

But neither DEP nor Intervenors have shown that the bylaw fails to comply with the voluntary limit on non-essential water use contained in the streamflow trigger condition. Indeed, it goes further than the streamflow condition would appear to require because adherence to the bylaw is mandatory. It may not restrict all non-essential water use – as far as I know, the bylaw does not limit residential pool-filling or car-washing – but the town, in responding to the order to complete, stated that it would modify the bylaw to comply with water use restrictions likely to be imposed in the modified water withdrawal permit. North Reading may wish to make even more changes to respond to the criticisms of the odd/even watering limit. But because the town bylaw does, or soon will, require limits on non-essential water use throughout the summer, there is no need to consider Intervenors' argument that voluntary watering limits be imposed from May through September.

As for changing the trigger point for mandatory watering limits, Intervenors have not shown that DEP's approach is unreasonable or that the approach they advocate is necessary. DEP's goal in imposing mandatory limits on non-essential water use in communities in the Ipswich River basin is to relieve stress on the river. In most communities that withdraw

groundwater from the basin, when mandatory watering limits are imposed, the community will no doubt reduce groundwater pumping. That is not necessarily the case with North Reading. Because it responds to increased summer water demand by increasing its water purchases from Andover, it most likely will respond to any decreased water demand occasioned by compliance with mandatory watering restrictions by first reducing its purchases of water from Andover. DEP's hope is that as overall demand is reduced, the town will reduce the volume of water it pumps from the Ipswich River basin. No party attempted to quantify by how much groundwater pumping would be reduced when mandatory watering limits are imposed under either DEP's or Intervenors' approach. Hence, there is no evidence to demonstrate that Intervenors' approach is necessary to ensure that North Reading does its part to preserve flow in the Ipswich River. As it is, the condition DEP imposed that most directly impacts the town's groundwater pumping during the summer and, thus, the impact of that pumping on river flow is the summer cap, a condition to which Intervenors do not object. The mandatory watering limits included in the permit may help the town adhere to the cap. There was no showing that earlier implementation of mandatory watering restrictions is needed to achieve this purpose.

But I accept, as I have accepted in other water withdrawal appeals from the Ipswich River basin, that the notice provision could be improved. DEP's goal is to have North Reading implement mandatory watering restrictions as soon as riverflow falls below 0.42 cfsm for three consecutive days. The modified permit requires only that notice of the restrictions be placed "at a minimum in a local newspaper within 5 days of the date of the required action." Kerry Mackin pointed out, however, that in a community with a weekly newspaper, it may take up to two weeks between the time action must be taken and newspaper notice is received by community members.

This is problematic. As I stated in an earlier decision:

> To the extent the notification provision is to have meaning, it must focus on the [town's] obligation to adhere as soon as practicable to voluntary or mandatory watering limits once streamflow has fallen below the specified flow levels for three consecutive days. Although the notification provision does not bar the [town] from using a quicker method of notifying its customers than the newspaper, the focus on newspaper notice overshadows all other potential forms of quicker notification.

Matter of Lynnfield Center Water District, Docket No. 2003-076, Recommended Final Decision, 13 DEPR 276, 285 (Mass. Div. of Admin. Law Appeals, Oct. 17, 2006).

Accordingly, I have redrafted the notification condition to focus on the town's responsibility to notify its customers "as soon as practicable" after watering restrictions have been imposed.

The town's notification responsibility is also impacted by its watering bylaw. The town bylaw appears to conform to the voluntary watering restriction provision of the streamflow trigger condition. In its response to the order to complete, the town stated that it already informs its customers of the bylaw's requirements through public education and informational material included with the water bill. Therefore, I also have provided that the town need not separately notify its customers that flow conditions necessitate watering restrictions if it has already imposed those restrictions.[22]

---

[22]Redrafted condition 5 is as follows:

> Beginning on ___, the Town shall implement the Required Actions [voluntary or mandatory watering restrictions] identified in the following table [found in the modified permit] whenever streamflow levels fall below the levels identified for three (3) consecutive days as measured by the USGS Stream Gauge noted.
>
> When the streamflow falls below the identified levels, the Town shall notify its customers as soon as practicable of the need to adhere to voluntary or mandatory restrictions as applicable. Notice to customers need not be provided if the Town has already implemented water use restrictions that conform to the applicable voluntary or mandatory restrictions. A copy of each

C. Industrial and Commercial Water Conservation

Intervenors object to the wording of Condition 10, which requires that North Reading implement a conservation program targeting its ten largest commercial and industrial water users. Condition 10 requires simply that the town "implement a program to reduce water use by its ten largest industrial and commercial water customers," and report to DEP on the effectiveness of the program. DEP will then "take whatever action it deems appropriate to promote the interests of the Water Management Act including without limitation modification of the Modified Permit to require additional actions to reduce commercial and industrial use."

Intervenors argue that the requirement is vague; it does not specify any steps the largest industrial and commercial users must take to reduce water use. Intervenors recommend that the largest users be required to perform a "water audit," as is recommended in the Water Conservation Standards for the Commonwealth of Massachusetts adopted by the Water Resources Commission. According to Intervenors' witness Kerry Mackin, a water audit "looks at all the water uses within a facility ... and recommends measures that should be taken to save water." Intervenors also maintain that because state Water Conservation Standards put municipalities and institutions in the same category as industrial and commercial users, Condition 10 should apply to large municipal and institutional users as well.

> notice given to customers shall be forwarded to the Department within 10 business days of its issuance. Notice, in total, must include: ... [the streamflow value that triggered the notification requirement, etc.]

This modified condition is the same as the one I recommended in appeals by the towns of Hamilton, Topsfield, and Wenham. See Matter of Town of Hamilton, 13 DEPR at 20 n.32. This condition was accepted by the DEP Commissioner. See 13 DEPR at 98. It is also the same as the one I recommended in the appeal by Lynnfield Center Water District that was subsequently accepted by the DEP Commissioner. Matter of Lynnfield Center Water District, 13 DEPR at 285 n. 23, adopted by Final Decision (December 22, 2006).

Intervenors have not provided sufficient reason to add municipal and institutional users to Condition 10. The modified permit promotes municipal water conservation by requiring in Condition 11 that North Reading retrofit its municipal buildings. In its response to the order to complete, the town stated that low flow devices had already been installed in most municipal buildings. It intends to survey town buildings to find where low flow devices have yet to be installed. The modified permit requires that if the town identifies any buildings that have yet to be retrofitted, it must report that to DEP and implement a plan to compete retrofitting. As for institutional users, there is simply insufficient evidence about their water use to determine whether there are large institutions in North Reading that should be covered by Condition 11.

I agree with Intervenors that Condition 10 is vague. Mackin asserts that a water audit is the starting point for any attempt to promote water conservation by industrial and commercial users. Water conservation is what DEP will be looking for when it reviews the results of North Reading's efforts with its largest industrial and commercial users. It would be appropriate, therefore, to make it clear in Condition 10 that North Reading's largest industrial and commercial users should perform water audits or otherwise demonstrate that they have taken appropriate steps to conserve water.

North Reading offered to perform a water audit for each of the top ten industrial and commercial water users. Each, for reasons not in evidence, turned down the offer. Intervenors concede that water users do not have to accept an initial offer to perform a water audit, but they argue that these users should be required to show that they have implemented all reasonable water conservation measures, and if that is not the case, then they should be required to perform a water audit.

While the condition in the modified permit is vague, DEP can hardly have meant that the town's effort would be sufficient if the town asked its ten largest industrial and commercial users whether they wished to have a water audit performed and then simply stopped when these users turned down the town's offer. The condition should be modified in light of the failure of the town's offer to elicit a favorable response. To achieve DEP's goal of promoting water conservation by these large water users, I recommend adding a water audit provision to the conditions, but not requiring that North Reading's largest industrial and commercial facilities repeat steps already taken.[23]

D. Leak Detection

Finally, Intervenors urge that North Reading, because it has a persistently high volume of unaccounted for water, be required to perform annual inspections of its water mains to detect leaks. The modified permit would require the town to perform a survey every three years to detect leaks in its water supply system unless an annual report showed that unaccounted water exceeded

---

[23] Revised condition 10 states:

> The Town shall implement a program to reduce water use by its ten largest industrial and commercial customers. Unless a water user subject to this provision can demonstrate that is has already taken all reasonable conservation measures, the program shall require for each user a water audit or some comparable review of water use, if not already performed, and a timetable for achieving water use reduction goals identified by the audit. On or before the two year anniversary of the issuance of the final permit, the Town shall report on the effectiveness of this program. Upon receipt of the program description and the report on its effectiveness, the Department will take whatever action it deems appropriate to promote the interests of the Water Management Act including without limitation modification of the Modified Permit to require additional actions to reduce industrial and commercial water use.

This provision is similar to one I recommended in the appeal by the Town of Wenham. See Matter of Town of Hamilton, 13 DEPR at 23 n.36. This condition was accepted by the DEP Commissioner. See 13 DEPR at 98. I have modified it slightly to reflect the evidence that the largest industrial and commercial water users in North Reading have already turned down an opportunity for a water audit.

10 percent that year or grew by 5 percent or more over the level reported the previous year, in which case the town would be required to conduct a leak detection survey the following year.

The rate of unaccounted water that North Reading reported between 1999 and 2004 was nearly 10 percent or above each year.[24] Leaks were not the sole source of unaccounted water; the town reported that metering problems contributed to its inability to account for some of the water. Still, the problem was significant enough that the town decided to perform leak detection surveys annually.

I see no need to modify the provision. The evidence suggests there is a significant and persistent leakage problem in town water pipes, one that, were it to be reduced, could address some of the water conservation concerns of DEP and the availability of water for growth that the

---

[24] The town reported unaccounted water for the period as follows:

Year	Unaccounted Water (as % to total water use)
1999	11.6%
2000	15.4%
2001	9.4%
2002	8.7%
2003	11.8%
2004	12.25%

In years prior to 2004, the town listed water lost to leakage as part of its unaccounted water. In 2004, it made adjustments to its total unaccounted water, which was an astounding 24 percent of its total volume. Some of the adjustments were for water used in fire-fighting and water use miscalculated due to meter errors. But it also included "Leaks (leak detection)." The reference in the report is unexplained, but presumably it means that the town, once it discovered a leak and calculated the volume of water lost to the leak, had then accounted for the water lost and did not list that volume in its final figure for unaccounted water. There is no indication in the record that this approach conforms to DEP practice on reporting unaccounted water.

town seeks. But the town has already recognized the leakage problem and the benefit of annual leak detection surveys. In 2002-2003, it saved 2.2 million gallons of water through leak repair, and in 2004 it saved 13 million gallons of water by repairing leaks. Yet despite these success, the town continued to report high levels of unaccounted water. Thus, the town is likely to continue to report unaccounted water levels of 10 percent or more, which would trigger the permit provision requiring a leak detection survey the following year. Hence, I find it unnecessary to require annual leak detection as this will apparently occur anyway.

Conclusion

With the exceptions noted in the decision, the modified water withdrawal permit for North Reading is sustained. I direct the Department to submit to the Commissioner, within three weeks of the date of this decision, a revised version of the modified permit that incorporates the changes I recommend, which appear in the attached appendix, and updated deadlines or date references in the permit to reflect the passage of time since the modified permit was issued.

Notice

This decision is a recommended final decision of the Administrative Magistrate. It has been transmitted to the Commissioner for her final decision in this matter. The decision is therefore not a final decision subject to reconsideration, and may not be appealed to Superior Court pursuant to M.G.L. c. 30A. The Commissioner's final decision is subject to rights of reconsideration and court appeal and will contain a notice to that effect. Because this matter has now been transmitted to the Commissioner, no party may file a motion to renew or reargue this recommended final decision or any portion of it, and no party shall communicate with the

Commissioner's office regarding the decision unless the Commissioner, in her sole discretion, directs otherwise.

_____

James P. Rooney
Administrative Magistrate