Although MA DEP believes the above issues, as well as others raised in our attached comments, need to be addressed in greater detail; MADEP still believes that an adaptive management approach is justified. MADEP has a long history in both studying the Massachusetts Rivers, which are a part of this system, and in designing and implementing controls to the sources. Upgrades are being completed at a number of WWTFs in Massachusetts including the Upper Blackstone Water Pollution Abatement District (UBWPAD), and the associated City of Worcester CSO, at costs ranging to 120 million dollars for these two facilities, which will further limit the discharge of pollutants to the Blackstone River including nitrogen. MADEP involvement in comprehensive studies such as the multi-year, multi-agency, inter-state Blackstone River Initiative were all in support of improvements. Given this fact, it seems reasonable that an appropriate adaptive management plan would consist of allowing the significant upgrades in Worcester to occur, address all local sources to the impaired waters in RI, and monitor the results of these actions prior to requiring additional severely restrictive and costly upgrades in MA.

MADEP also believes that concurrently with the evaluation of the RI upgrades during the first phase, the following unresolved issues need to be addressed prior to any additional changes: What is the actual concentration of nitrogen which will protect and restore the bay? What loading reduction will meet that concentration? What is the relative contribution from the other sources (e.g. air deposition, stormwater, other local nonpoint sources and runoff, septic, etc.)? What is the attenuation of nitrogen in Massachusetts' waters, and how much nitrogen is actually leaving Massachusetts over the state line?

To assist with this effort MADEP has been working with the Blackstone "data team" to identify existing data gaps and recently committed to the development of work plans to address data needs associated with nitrogen releases and impacts as well as other important gaps including the following:

1. Determining the total load of nitrogen leaving Massachusetts and entering Rhode Island.
2. Determining how much nitrogen originating from the UBWPAD is being attenuated before it leaves Massachusetts.
3. Determining nutrient flux in Massachusetts' impoundments.

This data and other information jointly developed by RIDEM and MADEP during the adaptive management approach will provide much more detailed data upon which future decisions can be made.

Finally, the recommendations previously outlined in this letter are based on the recognition that MA treatment plants are not going to be persuaded (nor could permit limits easily be defended) to undertake expensive treatment upgrades without solid evidence that the level of control is necessary to achieve water quality standards in the Rivers and Bay. In our opinion, the data we have seen thus far does not provide enough support to justify specific permit limits. In addition, even if load reductions that took account of all the above issues could be recommended, it is not evident that every plant would be required to undertake the same level of control; it might be equally effective, and more cost effective, to require different levels of treatment at different plants based upon size and nearness to the rivers and Bay. MA DEP believes it is scientifically appropriate to first control the sources that are closest to the point of impact (see Figure 1).

Attached in the following pages, please find our specific review comments with regard to the proposed permits, documents, and other analyses upon with the permit numbers are based.

I would like thank you for the opportunity to review these documents. If you have any further questions concerning these comments, please contact Rick Dunn of my staff at 508-767-2874.

Sincerely.

Glenn Haas
Director, Division of Watershed Management

Cc's: Arleen O'Donnell, Deputy Commissioner, DEP
Martin Suuberg, Regional Director, CERO
Paul Hogan, Supervisor, MADEP NPDES Program
Roger Janson, EPA Region 1

The analysis and results in this report, in lieu of a model are a good first step in providing the information basis for permit numbers. However, they are only the first step and need to be expanded and completed. The MADEP believes that additional work on the analyses in this report is required and that a number of sections in this analysis are not justified for the following reasons:

Nitrogen Attenuation: RIDEM has assumed that some attenuation is taking place in tributary rivers and that the instream attenuation from Massachusetts' facilities to the specified rivers and Bay would be 13%. This is significantly lower than an earlier value provided by RIDEM of 40%. The Long Island Sound study indicated attenuation was in the range of 50-60% in the Connecticut River from MA to Long Island Sound and recent data collected by Dr. Ray Wright from URI appear to show attenuation rates ranging from 21% to 60% (ave. 36%) for 3 surveys conducted during 2000 and 2001 in the Blackstone River from the Singing Dam in MA to the MA/RI state line with further attenuation likely by the time it reaches the Bay. In addition, RI DEM attenuation and loading figures in their analysis are based upon flow and concentration measured in widely different years. Loads in the river were collected for a period of one year 1995-1996 while loads for some facilities in MA were developed based on 2000-2001 data. Mixing the two data sets is at best questionable since, in general, as the flow goes up, the concentration of a parameter goes down through dilution and in-stream flows can vary greatly from year to year. Therefore, using these values from different years can produce unsubstantiated and incorrect values. Additionally, the analysis uses average flow values with maximum concentrations, rather than average concentrations. The maximum concentrations, which reflect outlier values for the most part, are significantly different than average values thereby indicating much higher contributions from the WWTFs. For example, at UBWPAD the 2003 May-October DIN concentrations based upon average values would be 8.3 mg/l, however if maximum values were used the numbers would increase to 11 mg/l.

MADEP believes that the attenuation is significantly greater and therefore data is required to determine the percentage and range rather than relying on general assumptions. Much more data is needed to determine how much each facility is discharging and to what extent attenuation is occurring. In support of this, MADEP is in the process of developing a workplan for the evaluation of nitrogen attenuation in the Massachusetts portion of the Blackstone River. MADEP is also in the process of defining what are the exact loadings at the state line, which is presently undefined. If the actual loading at the state line is unknown, there is no logical way to determine attenuation.

Selection of Target Instream Number and Thresholds: The RIDEM model originally selected to simulate conditions in the field, with the ultimate goal of selecting a target number for total nitrogen, could not be calibrated and verified in the deep channel and shallow flank areas of the Providence River. In lieu of the computer model, the physical model developed by MERL (Marine Ecosystem Research Laboratory) of an enrichment gradient experiment was used. However, this is primarily a static laboratory system which tries to replicate in a simple tank, the complexities of a dynamically active area with currents, stratification, atmospheric wind patterns, local nonpoint source impacts, sediments, etc. The tank is not affected by the vertical, and shoreline stratification, currents, and real-world conditions. The approach does not take into account many of the physical, chemical, and biological processes that can occur. The processes not replicated in this approach include: dilution, dispersion, and uptake mechanisms and attenuation. Without including the effects of currents, atmospheric deposition, attenuation by sediments, local nonpoint source inputs, flushing, and CSOs, the laboratory box experiments cannot easily be transferred to the more complex system.

Also, it appears that two other major nutrients were increased during the MERL experiment along with nitrogen so it is unclear which nutrient was actually responsible for algal growth. The additional nutrients added included phosphorus and silica. Given this, the plots showing large increases in chlorophyll or low dissolved oxygen (Figure 4) concentrations with increased nitrogen loads would be identical for the other two major nutrients, phosphorus and silica, since they were increased in proportion with nitrogen during the experiment. Equally, Figure 12 can be plotted using nitrogen loading, phosphorus loading or silica loading and maintain the same response values.

The report "Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers" inadvertently assumes that the proposal made by the Buzzards Bay Program represented MA DEP's guidance and standards. Although that approach had merit it did not account for the physical processes, nor all sources and sinks within the embayment itself (similar issues that have been identified for the RI DEM approach). Since these processes are critical a more rigorous site-by-site approach based on loads and residence times was taken through the Massachusetts Estuaries Program (MEP). While MA DEP believes a case-by-case analysis is necessary (consistent with EPA guidance), it is true that in the first few evaluations, the threshold concentration of TN in the critical portion of the various embayments was estimated to be 0.38 mg/L TN, but this may not be a universally applicable figure.

The MERL tank comparison is a good first step, but needs to be modified and expanded to include the other sources, which may be significant contributors of nitrogen.

For example, relative loads for point source, nonpoint source, and atmospheric deposition have been proposed previously with the percentages as follows in Table 1.

Table 1. Estimates of percentage N loads to Narragansett Bay from various sources based On several references (Total Load estimated to be about 9,100 kgN/yr by Nixon (1995)

Author	Point	NPS	Atmospheric	Year Published
Alexander	62	28	10	2001
Castro	73	14	13	2001
Roman	73	4	23	2000
Moore	68	17	15	2004

Loads from Massachusetts WWTFs: In calculating nitrogen loads from the WWTFs, the average daily flows were used with the maximum concentrations. Use of the maximum concentrations severely overestimates the contribution of sources as outlier values are used in place of average values. This will skew the data for some facilities as compared with others as indicated earlier. Seasonal average values provide a much closer picture of actual loads.

In order to evaluate how the Massachusetts facilities compare to the Rhode Island facilities, MADEP conducted a desktop evaluation as presented in Table 2. That table compares relative loads for 9 facilities in RI with 10 facilities in Massachusetts using the average summer monthly flows from 1995 & 1996 for RI WWTF's and from 2000-2003 from MA WWTF's. Two scenarios were reviewed. First, loads were developed assuming all facilities were discharging secondary effluent with a total nitrogen concentration of 15.0 mg/l (representing estimated existing conditions). The second scenario assumes that all facilities in RI are upgraded according to the proposed permits to meet either 5.0 mg/l or 8.0 mg/l total nitrogen for the summer months (May through October). However, for demonstration purposes, facilities in MA were

assumed to discharge present loadings during the summer months. There were two exceptions. The UBWPAD was assumed to be upgraded to 10 mg/l TN (which is already underway) and the Millbury WWTF was removed because it is now tied into the UBWPAD. Also since average TN concentration data was not available for the Attleboro and North Attleboro WWTP a daily maximum concentration was used resulting in very conservative estimates for these facilities. Review of the table shows that the RI facilities are likely contributing about 67% of the point source nitrogen load under existing conditions and Massachusetts' facilities are contributing about 33%. With the proposed limits implemented in RI, this would change to 52% for RI and 48% for MA, meaning that even once the proposed permits are implemented RI still contributes more point source loading to the Providence and Seekonk Rivers and to the Bay than Massachusetts point sources. Note that these figures do not account for any attenuation of nitrogen originating in MA nor does it include many of the additional local loads previously identified. Clearly this data supports an adaptive management approach.

Another major uncertainty, and more to the point, a misapprehension, is the assumption that the design flow of 56 MGD at Upper Blackstone will be reached. This facility serves a combined sewer system and capacity is provided to treat wet weather flows. Long-term summer loads of N need to consider the likely dry weather flows, which will convey the greater portion of the nitrogen load to the Blackstone and these are likely to be unrelated to the design flow. This same consideration would apply to any of the other POTWs that serve combined systems, which include NBC's Fields Point and Bucklin POTWs (average annual flow of about 51 MGD over the period 1986 through 1999 and 31 MGD between 1990 and 1999 respectively with no discernable trend); average summer flows would continue to be lower than the annual average unless a large growth in the population served is expected.

Finally, we had difficulty reviewing the document titled "Evaluation of Nitrogen Targets and WWTF Load Reductions for The Providence and Seekonk Rivers" because the terms used in the analysis were inconsistent throughout the document. It would be clearer if the analysis used dissolved inorganic nitrogen (DIN) throughout and then added the concentration of refractory nitrogen at the end for the permit limits. For instance, the MERL loadings are in terms of DIN, but in Figure 19 various loadings of TN from the POTWs are used for comparison, which is not a valid comparison. It would be valid if the TN values were in fact for DIN values, but then the TN values would be 2 mg/L higher using the protocol suggested in the report to account for the assumed concentration of refractory nitrogen. As a result it is unclear if the permit limits (based on the MERL analysis) should be for DIN rather than TN, which could be a significant cost savings to some communities.

Wet Weather Effects: Some sources not only closest to the Bay, but with potentially the highest non-treated loads, (i.e. the wet weather sources and effects) are not included. The RIDEM report includes the time frame of May through October, during which there will be numerous and periodic inputs from wet weather point sources, as well as local nonpoint sources both overland and through septic systems from this highly urbanized area. These inputs have the potential for being quite large. Given not only the retention/flushing time of these areas, but also their physical structure, and the fact that these local sources are discharging or flowing into the shoreline areas where the greatest detrimental effects have been measured, these could be directly producing large effects. A full evaluation and ranking of these sources is needed. Even while the point sources are undergoing upgrades, these upgrades could be offset by wet weather effects of local sources directly to the impacted waterways.

It is also of note that the Seekonk and Providence Rivers are the subject of substantial amounts of runoff and CSO overflows from a highly urbanized area. The Seekonk River in particular also appears to have limited flushing during low flow periods. The urban runoff and low flushing rate raise the question of what the specific water quality impacts of these local sources truly are and also what the specific target or goal should be.

CSO Inputs and Effects: One wet weather aspect, which needs to be highlighted, is the inclusion and clarification, of the contribution from the RI CSOs, which in most cases are direct discharges to the rivers and Bay during the May through October time frame. The report needs to factor in and analyze the number of discharge locations, the frequency of discharges, and discuss the Bucklin and Fields Point overflows including projected increases in discharges. According to RIDEM, these presently operate as bypasses during storm events. The actual workings of these facilities are unclear, as well as how these facilities will change with construction, and the number of discharges during the May through October time frame. However, it appears that Bucklin Point is being designed to handle 116 mgd. There is no mention of this in the TMDL report or adjustments to the calculations to show the effluent increases during the storm events. Flow data indicates summer time maximums up to 60 mgd. The RI DEM evaluation however uses a much lower value. The data should be clarified to reflect the discharge location, number of overflows per season, concentration of nitrogen parameters in the overflows, etc. prior to a determination of how this is being translated into effects on the confined waterways of the Providence and Seekonk Rivers.

One other potentially detrimental effect on the Providence and Seekonk Rivers and the Bay is not initially evident from the permit. A review of the permit indicates permit limits based upon monthly averages that are given as 1293 lbs/day for the Bucklin facility, 2711for Field's Point, and 694 for East Providence. This indicates that the daily inputs can be substantially large and fertilize algal blooms with corresponding DO problems. There are no maximum concentrations for daily discharge. No maximum daily flows. The report should review maximum numbers and range of days that these numbers cover.

It does not seem logical to create an analysis based upon a review of only the dry weather effects from the facilities when periodic CSO discharges and overflows may dwarf these when analyzed on a daily basis. If you were to take these numbers and divide them by 365 days the numbers would appear insignificant. But when the discharges occur in a compressed time frame in a confined area as in these river systems, they should be evaluated for the time frame during which they occur. This is evidenced by looking at lake systems where a heavy rain event is followed the next day by a large and significant algal bloom. If you were to take the loading that happened during that one day and average it over the year, the cause and effect would not be related. In these permits, the large daily storm water effluents are being averaged over a one-month time frame, obscuring the daily effect on the rivers and bay of the CSO discharges.

Figure 1 – Location of RI POTW's in Relation to the Impacted Resources

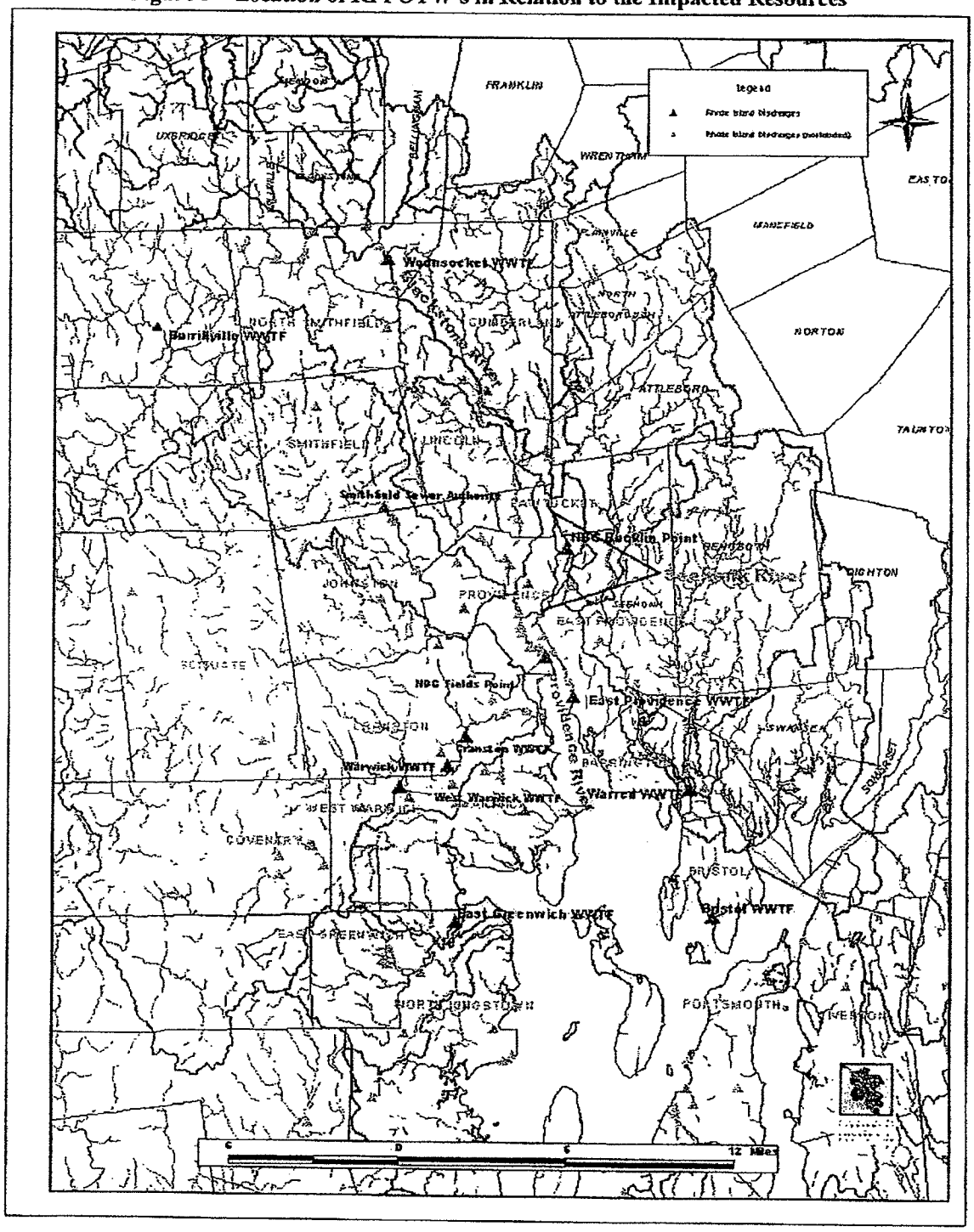

Table 2

Loadings Based On Average Summer Flows & TN

Column 3 assumes all facilities are currently secondary treatment discharging 15 mg/l TN @ ave. monthly flow

Column 4 assumes all reductions to 5 or 8 mg/l TN are achieved in RI and MA facilities are achieving existing TN concentrations based on DMR data (2000-2003)

Facility	May-Oct 95-96 Flow Monthly Ave MGD	Typical Secondary Loads Load @ 15 mg/l in lbs/day	New Permit Loads for 5 or 8mg/l lbs/day
RI Facilities			
Cranston	11.50	1439	767
E.Providence	5.18	648	346
Bucklin	20.95	2621	874
Fields	41.60	5204	1735
Warwick	3.34	418	223
W.Warwick	4.63	579	309
Woonsocket	7.37	922	307
Smithfield	1.45	181	97
Burrillville	0.74	93	49
RI Total	**97**	**12105**	**4706**
		67%	**52%**
MA Facilities**			
UBWPAD	34.00	4253	2836
Attleboro	4.58	573	654
NoAttleboro	2.82	353	290
Millbury	1.25	156	0
Grafton	1.72	215	226
Northbridge	0.98	123	64
Uxbridge	0.76	95	138
Upton	0.22	28	36
Douglas	0.18	23	9
Hopedale	0.39	49	49
MA Total	**47**	**5867**	**4302**
		33%	**48%**

**** MA numbers include no attenuation.**

Flow & Loadings based on DMR data from 2000-2003

Note: 1) Millbury now connected to UBWPAD

2) UBWPAD assumed to meet 10 mg/l TN as a result of upgrade

Attachment A6

Attachment 1: NBC Comments on RIDEM's "Evaluation of Nitrogen Targets and WWTF Load Reduction for the Providence and Seekonk Rivers"

Evaluation Report

RIDEM's efforts to establish a Total Maximum Daily Load (TMDL) for the Providence and Seekonk Rivers by means of a computerized model were unsuccessful because the mass transport portion of the model could not be successfully calibrated. The model was to be used to determine nitrogen loadings in the Providence and Seekonk Rivers necessary to achieve water quality standards for dissolved oxygen.

Instead of the TMDL, RIDEM prepared an analysis entitled "Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers" as the basis for the establishment of nitrogen loadings for the WWTFs. It is NBC's understanding that no further water quality modeling work is planned by RIDEM and that this report will serve as the basis of future decisions to be made by RIDEM with regard to allowable nitrogen limits from WWTFs. Therefore, NBC has conducted its review of this report as though it were the TMDL development document. with additional comments based on information provided by CH2M Hill and Associates[2], Dr. Jamie Maughan.

With this in mind, NBC has, as you suggested, closely reviewed the information and conclusions contained in the draft report, as well as the additional information provided by DEM in response to NBC's August 11, 2004 letter. Below, please find our comments and questions.

Comments on the Proposed Permits

1. Basis for Limits

We request the proposed limit for both the Field's Point and Bucklin Point WWTFs be changed to either a TN monthly load limit only or, if a concentration limit is also to be included, that it be 5 mg/l Total Biodegradable Nitrogen (i.e. TN minus refractory N).

The Attachment A table of the draft RIDEM nutrient permit modifications includes a requirement to meet a monthly load limit of 1293 lbs/day (Bucklin Pont) and 2711 lbs/day (Fields Point) as well as a concurrent concentration limit of 5 mg/l TN. We believe that a monthly load limit without a concentration limit would be a more reasonable approach given the variability in flow and influent strength (particularly associated with wet weather) at both facilities.

In establishing the 5 mg/l TN permit limit, RIDEM has assumed that 1.95mg/l is refractory N. RIDEM also claimed in its 12/23/2004 letter that the average value for effluent organic nitrogen is 1.4 mg/L, while the data for 1995 and 1996 are 2.3 ± 3.8 ppm organic nitrogen for Bucklin Point and 2.1 ± 1.8 ppm for Field's Point (calculated as TKN minus ammonia). Due to improvements in the analytical methods used as well as operational improvements, both Field's Point and Bucklin Point effluent organic nitrogen data for 2004, which are thought to be more reliable, show an organic nitrogen component of 3.6 and 3.2 ppm for Field's Point