K. Response to Comments Concerning Projected Effects of the Permit on Mirant Kendall's Operations

Comment K1: Curtailments as Flexibility. At p. 2, the Summary Fact Sheet states:

"Assuming favorable energy market conditions, maintaining [the proposed in-stream thermal limits] may require [Mirant Kendall] to curtail peak capacity operations on certain days, particularly in the summer. However, these permit conditions provide [Mirant Kendall] flexibility in its operations to continue to generate electricity for the New England market while not over taxing the environment".

Mirant Kendall has demonstrated to the Agencies that permit limitations such as contained within the draft Permit will force Mirant Kendall during any normal summer to curtail operations at Kendall Station to such an extent that the plant's economic viability will cease, and Kendall Station will be forced to shut down. Yet the Agencies have not addressed that showing; their only response is to claim that the permit provides Mirant Kendall with "flexibility."

Mirant Kendall acknowledges that the Agencies are not obligated to take Mirant Kendall's economic issues into direct account for purposes of determining permit limitations under § 316(a) of the Clean Water Act. However, the Agencies are obligated to issue a permit that contains provisions that make sense, that are only as stringent as necessary to ensure the protection and propagation of a BIP, and that do not impose unnecessarily stringent provisions where these provisions would certainly cause grievous harm to the operations of Kendall Station.

Response K1: EPA and MassDEP have not been cavalier in addressing Mirant's concerns about the possible economic impact of these permit conditions and the flexibility provided for in the permit. First, EPA confirms the critical point that Mirant concedes in passing: section 316(a) makes no provision for EPA to factor cost into the determination of permit limits necessary to protect the BIP. Therefore, the only legally cognizable argument this comment makes is that the permit limits EPA has developed are more strict than necessary to protect the BIP, and are therefore, the argument goes, unreasonable in light of the potential impact these limitations may have on operations at Kendall Station.

EPA has carefully considered the many points Mirant has made challenging the necessity of the permit's 316(a) limits to protect the BIP and has already addressed them in some detail in Sections C, D and F of this document. To summarize briefly, EPA has not simply imposed the most conservative assumptions available, thereby unnecessarily over-protecting the BIP. There are many elements of the design of this permit that give Mirant flexibility to add heat to the Basin that will add some degree of stress to the BIP, and EPA has done its best to accommodate Mirant's discharge of heat consistent with the requirement that EPA has a reasonable assurance that the permit will protect the BIP.

EPA has essentially ceded the Cambridge side of the Basin in the vicinity of the Kendall Station discharge to heat levels that will not support the BIP, including heat levels that will have acute effects in violation of the Massachusetts' mixing zone requirements (see Response to F4 (part 2) and Response to Comment related to F4 from CLF). In exchange, requirements have been developed for the Zone of Passage and Habitat on the Boston side of the Basin to protect the BIP. Even in the Zone of Passage and Habitat, as a scientific and technical matter EPA has not relied on the most conservative assumptions available. As discussed above, many of the critical temperatures developed for this permit were derived by weighing temperature levels indicated by the scientific literature with generally higher levels suggested by observation of ambient water temperatures in the Basin. Although it would provide more certain protection to the BIP simply to have adopted the temperatures derived solely from the literature, EPA has factored in actual conditions in the Basin. For example, in a variety of instances the compliance regime in the permit allows the Station a two degree Fahrenheit "buffer" when enforcing these critical temperatures. The permit states that to achieve a 59 ºF in-stream temperature in the Zone of Passage and Habitat to protect yellow perch spawning, a 61 ºF temperature limit is enforced at the monitors (see Section 5.6.3i of the DD). There is a large body of site-specific water quality data from the lower Charles River Basin that justify the allowance of this buffer (see Response Related to C44 from MA CZM and CLF). In addition, based on information submitted by Mirant, it is assumed that Kendall Station will manage its heat discharge in such a way that temperatures will remain below the 61 ºF limit (see Section 5.11 of the DD). The permit assumes Mirant will operate with a margin of compliance, and the permit makes that margin of compliance available to Mirant as an element of operational flexibility. After further consideration of the two degree buffer during the summer months, EPA and MassDEP have refined the compliance regime during the summer to ensure that there remains a consistent refuge at 81º F, at least on the margins of the ZPH. This issue is also discussed in Response Related to C44 from MA CZM and CLF.

Comment K2: In May 2003 the Agencies asked Mirant Kendall to project the results for the operations of Kendall Station were the final NPDES renewal permit to include in-stream temperature limits such as they have now proposed. The Agencies' request identified several alternate in-stream temperature scenarios. In Mirant Kendall's RFI Response (AR# No. 472), the company projected the results using 1999 river flows and background temperatures as the base conditions for the Agencies' scenarios and several others.

Among the scenarios projected in the RFI Response were several that are very similar to what the Agencies have now proposed, which is to require compliance with 4-hour average temperature limits in the proposed Zone of Passage and Habitat and not to allow use of the proposed new outfall and diffuser. Under those conditions, the RFI Response showed that Kendall Station would have been curtailed to its most minimal level of operations (10% heat load) on 90% or more of the summer days in 1999. Further, the RFI Response showed that curtailments at that level, indeed, even less onerous curtailments,

would make the Station economically inoperable because it would lose so much revenue that it could not cover its fixed and variable costs. Mirant Kendall also provided alternative approaches in the RFI Response that would still be protective but would allow the Station to operate, and requested the opportunity to cooperate with the Agencies to develop a workable approach.

Even though it was a response to their request, there is no evidence that the Agencies have given any consideration to the information or alternatives in the RFI Response. The projections in the RFI Response are not even mentioned in the permitting documents, much less discussed. It is irresponsible, arbitrary and capricious for the Agencies to propose permit terms, in the face of evidence that they will force the closure of Kendall Station, without any acknowledgment or discussion of that evidence.

Response to K2: EPA and MassDEP believe that the permittee used a worst case year for this analysis, a different year than that which MassDEP requested, which tended to show a worst case scenario for potential plant shutdowns, particularly during the more profitable summer months. (See Comment K3, where Mirant acknowledges that 1999 was not representative of typical summer conditions). It appears that the use of an outfall diffuser would allow the permittee to operate appreciably more than operation without the diffuser. However, as EPA and MassDEP described in the introduction to Section E comments, the burden on the permittee dating back to at least the permit application in 1999 required a full evaluation of the diffuser potential benefits and drawbacks. This evaluation has not been completed to the permitting Agencies' satisfaction. Therefore, a determination was made to not allow a diffuser discharge at this time. See the introduction to Section E for a complete discussion regarding the diffuser issue.

EPA and MassDEP have fully taken into account the permittee's RFI response and understand that Mirant will be faced with the potential for significant days of curtailed operation in the summer. Despite that potential, the permit must require the protection and propagation of the BIP, the attainment of water quality standards and minimizing the effects of the cooling water intake structures.

Regarding the permittee's BTU heat load approach as described in Comments C5 and D5, EPA and MassDEP determined that this approach was ultimately not protective of the BIP and thus, it has not been offered as an alternative compliance approach in this permit. See Responses to C5 and D5 and responses concerning alternative compliance approaches.

Comment K3: Mirant Kendall also has projected the impacts of the now-proposed permit terms on the operation of Kendall Station. These new projections differ from the projections in the RFI Response in several ways:

1. The new projections used the ZPH and in-stream temperatures actually

proposed by the Agencies as Attachment A to the draft NPDES renewal permit. The projections for the RFI Response had used the somewhat different in-stream temperature limits provided in the Agencies' 2003 RFI.

2. The new projections are based on actual river flows and background river temperatures for 2001 whereas projections in the RFI Response were based on similar data for 1999. The river flows and temperatures for 2001 are considered more representative of typical summer conditions.

3. The new projections assumed that the Station, if not curtailed due to the NPDES permit, would run pursuant to a forecasted load dispatch profile based on simulated market conditions.

4. Mirant Kendall then applied the same thermal and hydrodynamic model used throughout these permit proceedings to determine the extent to which Kendall Station would be required to curtail its market-based operations in order to avoid any exceedance of the proposed in-stream limits.

5. For comparative purposes, Mirant Kendall also substituted the proposed permit terms for the scenarios the Agencies' had described in the May, 2003 RFI and re-applied the model under the 1999 conditions, still assuming the Station was unconstrained by market forces.

The resulting number of days the Kendall Station's operations would exceed applicable in-stream temperature limits are summarized and compared in MK comment Ex. No. K3. They show that were the proposed in-stream temperature limits applied to 1999 river conditions, the Station would be curtailed from operating at its maximum capacity for a total of 63 days during the summer months of June, July and August. The Agencies' modification of the averaging time for Delta T resulted in about a 20 day decrease in curtailments as compared to the RFI Response results. The overall result, however, curtailing the plant two-thirds of the summer, is consistent with the results described in the RFI response for the scenarios requested by the Agencies in their 2003 RFI.

The results show that even under the more realistic and market-based case (2001 river conditions and the reduced, market-based Capacity Factor), the Station's operations under the proposed permit limits would still be curtailed from operating at its expected capacity for 43 days, almost half of the available operating days during the summer months.

Response to K3: EPA disagrees that the permitting Agencies did not carefully consider the implications of Mirant's original RFI submittal. The new scenarios Mirant modeled as part of the company's comments on the Draft Permit have also been carefully considered. Mirant appears to conclude that EPA did not consider its submissions because Mirant disagrees with the conclusions EPA reached after studying them. But the record of this permit indicates EPA thoroughly examined the issues raised by the RFI

submittal and Mirant's comments.

The RFI made it clear that it would be much easier for Mirant to comply with the temperature regime required in the permit if Mirant were allowed to construct and discharge through the proposed diffuser. EPA takes this point seriously, and is prepared to consider an application to install the diffuser. The reason the diffuser has not been approved as part of this permit renewal is not to force Mirant to curtail operations unnecessarily in the summer. Rather EPA concluded that operating the diffuser could exacerbate the eutrophication problem in the Basin and could cause other water quality problems, as described more thoroughly in Section E of this document. If Mirant can demonstrate that it can operate the diffuser in a manner that addresses that risk, and other risks to the aquatic community that could result from the installation and operation of the diffuser, to the satisfaction of the permitting agencies, EPA has no objection to Mirant using the diffuser to redistribute its heat discharges in the Basin consistent with the conclusions Mirant derived from its RFI response.

Mirant notes that EPA adjusted the Delta T averaging period in the permit and that one resulting effect of this adjustment was the likely reduction of the potential for curtailments in the summer. This change, the reasons for which are explained in Response K4, is further evidence that EPA considered Mirant's RFI submittal and the company's concerns about the operational limits this permit would impose during the summer.

EPA is obligated under CWA 316(a) to protect the BIP, and there is no authority to relax the temperature limits that are necessary to protect the BIP based on economic considerations such as the potential curtailments presented in the RFI response. While it is useful as a policy matter to understand the possible operational consequences of different compliance requirements in the permit, as a matter of law EPA must evaluate whether to adjust those compliance requirements based on the requirement to protect the BIP, not based on the desire to maximize the plant's capacity to operate in the summer.

Comment K4: Impact on Station Curtailments of Potential Refinements to Permit Conditions. Mirant Kendall used the thermal and hydrodynamic model to evaluate the impact on curtailments to Kendall Station's projected market-based level of operations under several potential refinements to the proposed permit limits and ZPH, assuming 2001 river conditions. The results are discussed below.

1. Using the same in-stream temperatures and ZPH proposed in the Draft Permit, use of the proposed new outfall and diffuser for up to 50% of the cooling water discharge. The results indicate a projected reduction in the number of curtailment days from 43 to 20 days, thereby reducing the curtailment impact of the proposed in-stream temperature limits by one-half.

2. Use a 24-hour averaging period instead of a 4-hour averaging period to determine compliance at the monitoring points in the ZPH. This refinement results in a projected reduction in the number of curtailment days from 43 to 27 days.

3. Provide a certain number of "allowance" days when in-stream temperatures could exceed the established in-stream limits in recognition of the natural variability of river temperatures. If this approach was adopted for the summer time months, the projected number of curtailment days would be reduced by 15 and foreseeable springtime curtailments would likely be rare.

4. Delete the requirement to meet the temperature limit at two feet at proposed Station 3 because that depth at that Station is not located within the significant habitat of the largest species. This refinement results in a projected reduction in the number of summertime curtailment days by 8.

5. Designate the upstream boundary of the ZD (running through proposed monitoring Station 2) as the reference for compliance with Delta T limits and delete the requirement for comparisons to proposed Station 1. This refinement results in a projected reduction in the number of curtailment days by 7.

The Agencies should take the above recommendations into consideration and cooperate with Mirant Kendall to devise a compliance system that appropriately balances adequate protection of the BIP with the operational needs of Kendall Station.

Response K4: EPA has addressed elsewhere in this document each of the items in the "portfolio" of operational refinements that Mirant proposes. The basic flaw in the presentation of this portfolio here is that they are presented largely as means to avoiding potential curtailments. As discussed above, however EPA must evaluate these proposals based on their potential impact on the BIP (or in the case of the diffuser, its impact on water quality standards). Although this evaluation is discussed in more detail elsewhere, in summary the conclusions are:

1. As discussed above, once Mirant can demonstrate that the diffuser will not likely contribute to eutrophication of the Basin and will not contribute to the other water quality problems discussed at length in section E, EPA will permit it, unless other effects of the installation and/or operation of the diffuser unduly compromise the aquatic community when considered in concert with other impacts to that community.

2. The temperature extremes that could be employed and still meet a 24 hour average of the critical temperature requirements would subject the BIP to

unacceptably high temperatures. The stress created by those temperatures will not be somehow remediated by the lower nighttime temperatures 12 hours later. Kendall Station has the capacity to create short term spikes in temperatures during the hot summer days with high power demand during times when the BIP is already stressed. This would likely seriously degrade already stressful conditions for the BIP. EPA has shown flexibility on the issue of averaging time, however, by agreeing to measure delta T on a 24 hour basis because it can be reasonably justified that averaging the temperatures over 24 hours is necessary to account for the time lag of water moving in the Basin. See also Responses I4 and L2.

3. EPA partially addressed this comment by providing that springtime temperatures in the ZPH could rise 2 degrees above ambient to account for the large variability of temperatures during the spring. EPA believes that the methodology MassDEP uses to determine attainment of the temperature criteria in its WQS is not directly applicable or analogous to the problem this permit is trying to address. Using 24 hour averages with a 10% allowance makes sense when assessing the natural seasonal and diurnal variation in water temperatures. Here, however, EPA has to decide how to regulate temperature to protect the BIP where a single facility has the capacity to dramatically alter the temperature regime of this portion of the Basin. Mirant's heat input is capable of creating temperature spikes that bear no resemblance to the sort of natural variation the MassDEP methodology is designed to address. Among other impacts, avoidance behavior by adult and juvenile fish can result from such short term temperature spikes. Therefore, EPA concludes it is necessary to use an averaging time less than 24 hours to ensure that temperature spikes do not cause fish to avoid the ZPH.

4. The record documents that juvenile alewife and blueback herring are found throughout the water column and typically come to the surface at night to feed. EPA and MassDEP, therefore, have concluded that juveniles must be allowed some suitable habitat near the surface to feed. Thus, it is necessary to ensure that the temperatures at the 2 foot depth are not so high as to deter that surface feeding. In addition, a study has shown that herring and shad appear to prefer to use surface waters during passage up and down a river (AR# 542, Crecco, et. al.1983). One of the key biological functions EPA and MassDEP are trying to protect in the ZPH is the use of this part of the Basin as passage for migrating fish.

5. The proposal to move the monitor for the background temperature downstream, closer to the outfall, runs the risk of placing that monitor in a location where it would be measuring temperatures elevated by Kendall Station's discharge rather than measuring temperature levels that reflect a

more true background condition. EPA cannot agree to place this monitor in a location where the Kendall Station may in effect be setting its own background temperature, thereby effectively relaxing the delta T limit by raising the background level against which the delta T would be measured. See also response to I5.

L. Response to General Comments

Comment L1: Mirant Kendall as Largest Industrial Discharge to the Charles River. At p. 1, the Summary Fact Sheet states:

> this permit is an important component of continuing broader public and private efforts to restore the health of the Charles River Basin and Boston Harbor. Since [Kendall Station] is the largest industrial discharger impacting the habitat and water quality of the Charles River Basin, appropriate permit requirements are critical to this larger effort.

Mirant Kendall respects the efforts by the Agencies and others to improve water quality in the Charles River and Boston Harbor and acknowledges that the quantity of its cooling water discharge makes the Kendall Station the largest single discharger, in terms of flow quantity, to the Charles River. Mirant Kendall also acknowledges that its long permitted discharge inevitably raises water temperatures somewhat in a limited area of the Lower Charles River Basin, as it has done for fifty years, as compared to what the temperatures would be otherwise.

By themselves, however, those facts do not begin to justify the assertion that the proposed new limits on Kendall Station's discharge, which would severely reduce the Station's existing limits, are "critical" or even relevant to making improvements in the Charles River Basin. In fact, nowhere in the Agencies' permitting documents do they make any showing that in-stream temperature increases from the past, current or proposed discharge from the Kendall Station have any significant impact, much less that it is "critical" to drastically reduce the Station's thermal limits.

It is clear that other factors – the CSOs, the impacts of man-made hydrologic alterations, and storm water discharges, among others – are much more critical to water quality in the Charles River than its "largest industrial discharger." The Agencies have been blinded by their commendable efforts on other issues into believing that they must cut every discharge to the maximum extent it is conceivable to justify whether or not the discharge is actually causing problems.

The Agencies have failed to make the required determinations whether this discharge in this location will have any actual impact that requires reduced limits going forward.

Response to L1: EPA and MassDEP listed the fact that MKS is the largest industrial discharger to the Charles River Basin as a point of fact. In the permit record, concerns were identified with the upgraded operation of the Station (increased electricity generation). Increased Station operation has the potential to increase the thermal heatload to the lower Basin above the discharge profile of the Station recorded over the past fifty years, to elevated levels much closer to the maximum permitted thermal discharge. This new operating scenario has the potential to exacerbate existing water quality standards impairments.

In Section 5.3 of the DD, there was a detailed discussion regarding the past and proposed uses of once through cooling water and heatload discharged to the lower Basin at historical levels and as a result of the proposed increase in Station generation. Without the submission of an acceptable hydrodynamic model to translate the higher heatloads into resulting temperatures in the receiving water under various river flow conditions, detailed temperature impacts to the river could not be predicted. The permittee did not meet its burden to credibly identify proposed temperatures in the receiving water and demonstrate that these temperatures would still be protective of the BIP. Therefore, EPA and MassDEP decided to use biological and environmental information to set protective temperatures in an appropriate portion of the river (the ZPH) to protect the balanced indigenous population under the new generating profile. The scientific literature and site specific field data used to determine the protective water temperatures were clearly referenced in the DD.

In a reversal of statements included in the permit renewal application submitted by the permittee in February of 2001, the permittee now contends that future thermal discharge will not exceed historical thermal discharge. The elevated summer heatload discharge from Kendall Station since the upgrade of the facility conflicts with this position (see Responses to B1, B3 and C3). Even if the Station does return to a thermal discharge profile consistent with historical discharge and well below the currently permitted maximum thermal discharge, EPA and MassDEP must address potential impacts from the facility based on maximum permitted discharge limits. When a biology-based approach was used to establish protective temperature limits for the ZPH, it became clear that past temperature limits were not fully protective of the Charles River BIP.

Response B1 discusses the in-stream thermal profile from the past, current and proposed discharge from the Kendall Station and Response C3 identifies the adverse impact to the alewife and blueback populations in the lower Basin from Kendall Station operation. This assessment is a further justification for the temperature limits placed in the permit.

While the DD identified a range of other factors that also negatively influence water quality in the Charles River, EPA and MassDEP do not agree that it is clear these other factors are much more critical to water quality than the impact of the Kendall Station discharge. Different components of water quality are affected by the various factors, and EPA and MassDEP made no attempt to rank the severity of these other factors, nor was a ranking of the factors required.

EPA and MassDEP maintain that these permit requirements are critical to the protection of water quality in the Charles River.

Comment L2: Allowance of Theoretically Lethal Temperatures Near the Plant. At p. 2, the Summary Fact Sheet states:

> the [draft] permit allows one half of the Charles River in the vicinity of the power plant and Longfellow Bridge to reach temperatures which can be lethal, exclusionary or otherwise harmful to the various life states of indigenous fish, as long as at least one half of the River's cross-section maintains temperatures that

protect fish populations, including fish migration and reproduction.

The Agencies appear to draw much justification for the proposed temperature limitations in the proposed zone of passage and habitat (ZPH) from the claim that the other half of the Charles River in the vicinity of the plant would be allowed to reach lethal temperatures. Actually, in-stream temperatures on the Cambridge side of the river have not and will not reach lethal temperatures. Indeed, during the past four years of monitoring in-stream temperatures directly in front of the outfall, at the 3' depth where the temperatures peak, temperatures have not exceeded 90º F. See MK Comment Ex. Nos. D17-1 through D17-4. These data reflect the fact that the thermal discharge, even at its maximum flow rate, is not large relative to the Charles River and at most is 20º F warmer in the outfall pipe. It is then immediately cooled to temperatures 6º F to 7º F above the ambient temperatures; there is no zone of extremely different water temperatures. While temperatures in that area certainly are sometimes higher than the temperatures proposed by the Agencies for the ZPH, there is no evidence that those temperatures have been lethal or have caused any adverse impacts.

Indeed, Mirant Kendall has submitted voluminous data to the Agencies showing the regular occurrence of river herring and other species throughout the lower Charles River Basin, including the areas on the Cambridge side of the river adjacent to the plant, at temperatures well above the Agencies' proposed in-stream limits. The Agencies disregarded those data by invoking the unevidenced possibility that the fish actually in the river might be "stressed." By that side-step, the Agencies have chosen to ignore the existence of a balanced indigenous population in the vicinity of the plant and co-existing with higher temperatures than the Agencies would now require.

Having side-stepped the lessons from the Charles River itself, the Agencies draw their proposed in-stream protective levels from laboratory studies that generally isolate the effects on biota of prolonged chronic exposure, which is far longer than the acute chronic 4-hour exposure that permit compliance is based upon. Those laboratory conditions are completely uncharacteristic of the actual conditions of biota in the real world, where in-stream temperatures rise and fall during the course of days. The Agencies should refocus their determinations away from laboratory studies and focus instead on the telling evidence from this complex river system itself.

Response to L2: EPA and MassDEP have collected data that refutes the claim of the permittee that "in-stream temperatures on the Cambridge side of the river have not and will not reach lethal temperatures." Further, the permittee is not correct in asserting that heated water discharged from Outfall 001 of Kendall Station is then immediately cooled to temperatures 6 ºF to 7 ºF above the ambient temperatures. These statements are contradicted by modeling results as well as actual temperature readings taken in the Zone of Dilution.

Water temperature projections and historical data were submitted by the permittee as part

of the document entitled *Supplemental Surface Water Modeling Report In Support of Kendall Station NPDES Permitting* (May, 2001). As listed in Section 5.5.1 of the DD, EPA and MassDEP determined that the model was not acceptable for evaluating receiving water conditions for two main reasons. First, there was concern with the permittee's approach used to calibrate the model. Second, no documentation was submitted to validate the method used to interface the near field and far field mixing associated with operation of the proposed diffuser. However, model results excluding the use of the deep water diffuser (all wall discharge scenario) were examined as a general guideline of water temperatures in the receiving Basin. Specifically, the Transverse Cross Section , In-Discharge Zone MP-7-MP4A Cross Section was reviewed. Based on this model run, historical 1999 temperatures at 0.25 meters were above 90 ºF at position 13 and 12 (Cambridge side near discharge, Tab 4) on July 6th and at position 13 on July 19th. More importantly, when the Future Transient All Wall Discharge model results at this station were reviewed (the only discharge configuration allowed by the permit), temperatures above 90 ºF were routinely predicted at points 0.25 meters deep and sometimes seen at 0.75 meters deep in several positions from the Cambridge side out toward the middle of the lower Basin. Temperatures above 90 ºF were seen at 0.25 meters on all days the model was run for All Wall Discharge (July 6, 19, 27, 31, August 1, 2 , 3). Temperatures as high as 98.38 ºF were predicted near the discharge, in the Zone of Dilution.

In addition to the general guidance provided by the model, site-specific data confirmed that water temperatures in the Zone of Dilution exceeded 90 ºF and were more than 6 ºF to 7 ºF above the ambient temperatures. Monitoring conducted by EPA on August 11, 2005, and August 3, 2006, recorded Charles River water temperatures at stations that coincided with the fixed, real-time continuous temperature monitoring locations established in the permit (Table F4.P2.CLF-1). Sampling was conducted after noon, in order to measure lower Basin waters once they had been exposed to several hours of solar radiation in addition to Kendall Station's thermal discharge. During the August 11, 2005, monitoring event, the highest temperature recorded at the Background Station (MS1 of the permit) was 81.1 ºF. In the vicinity of the Kendall Station discharge, temperatures were 98.7 ºF at the surface, 100.0 ºF at 0.6 meters and 100.6 ºF at one meter (TABLE F4.P2.CLF-1). The hourly average heatload recorded at the Station for the entire day of August 11, 2005 at Kendall Station was approximately 504 MMBTU/hr (Mirant Kendall, April 2006). The maximum daily heatload allowed by the permit in effect on August 11, 2005 was 556 MMBTU/hr. Therefore, when these insitu water temperature readings were taken, the Station was operating at approximately 91% of capacity. While not all stations were visited on August 3, 2006, temperatures in the vicinity of the discharge were recorded from 95.9 ºF at the surface to 101.4 ºF at 1.3 meters deep (Table F4.P2.CLF-2). See also Response to F4.

Mirant presented data showing the occurrence of river herring and other species in the lower Charles River Basin at temperatures above the in-stream limits. The permittee states that EPA and MassDEP ignored field data and only considered laboratory

experiments when formulating protective temperature limits. This statement is not correct. EPA and MassDEP acknowledged the field data and considered this site-specific information when the permit temperature limits were developed. The observation of fish at water temperatures above the established protective temperature limits in no way invalidates the selected limits. There are several reasons why Mirant's interpretation of the higher temperature fish collection data is flawed. (See Response to C3).

First, it is generally understood that when a population of fish encounters an environmental condition (the temperature of the water, in this case), while the majority of the population will likely respond more or less in the same way, the condition will produce a variety of responses across the population. The biological responses may span the entire range, from a severe stress and mortality response for some weakened individuals, to avoidance behavior in other individuals, through a no-effects response from other individuals. Fish that are infrequently collected or observed in low numbers in the Charles River at these higher water temperatures likely represent the minority of individuals that are less sensitive to water temperatures which have been demonstrated to cause harm or avoidance to the population as a whole. It is inappropriate in this case to set temperature limits based on water temperature data coinciding with only a fraction of fish collections at the highest relative temperatures observed. This practice would likely only protect the segment of the fish population least sensitive to elevated water temperatures, rather than be protective of the population as a whole.

Second, the temperature data submitted with the fish capture data were instantaneous readings taken in the vicinity of sampling. The temperature limits designed for the permit must be viewed in the 4 hour average format and the station locations specified as part of the compliance plan.

Third, the spatial characteristics of the Kendall Station thermal plume are dependent on many factors, including Station operation, river flow, and meteorological conditions. When collecting fish as part of a long transect run (large distance), the collection net could likely pass through several pronounced changes in temperature as a single transect is run. Therefore, the exact water temperature coinciding with the capture of a fish or group of fish is difficult to determine with certainty. In addition, EPA and MassDEP agree with the permittee that in the lower Basin, in-stream temperatures rise and fall during the course of many hours. When collecting fish during an overnight (at least 8 hour) gillnet set, the exact temperature when a fish or group of fish were captured is also difficult to know for sure. Even in the case of a relatively small distance, short time, collection method, such as beach seining, a near surface temperature reading may not reflect the near bottom temperature where the juvenile fish may have been captured.

EPA and MassDEP disagree that there is no evidence that higher water temperatures caused by Kendall Station discharge have caused no adverse impacts to fish populations. EPA and MassDEP have reviewed data that indicate that the thermal discharge from

Kendall Station has resulted in appreciable harm to alewife in the lower Basin. See Response C3.

EPA and MassDEP have incorporated the actual site-specific conditions of biota in the lower Basin together with controlled laboratory studies. For example, continuous temperature data collected in the Charles River by the permittee provided the justification for the appropriate 2 ºF buffer, which was added to protective temperatures (excluding certain summertime limits and monitoring points- see Response Related to C44 from MA CZM and CLF) to take into account the documented rise and fall of in-stream temperatures throughout the course of a day during much of the year. In addition, the spring-time river temperature data set, assembled over many years, was also provided by the permittee and fully considered by EPA and MassDEP as part of the permitting process. Temperature limit exceedances allowed in the spring by the permit are a direct result of the understanding and accommodation of these site-specific spring river conditions by EPA and MassDEP.

The following responses address the permittee's contention that the prolonged chronic exposure laboratory experiments used to support protective temperatures are not compatible with the compliance time interval of 4 hours used in the permit.

EPA and MassDEP acknowledge that laboratory studies cited in the DD generally isolate the effects on biota of prolonged chronic exposure, which is far longer than the 4-hour exposure that permit compliance is based upon. Under these controlled laboratory conditions, the fish are held in a tank at a constant, carefully controlled temperature, and mortality is documented over an extended period (24-hours). In developing protective temperature limits for this permit, EPA and MassDEP started with the results from these experiments to establish chronic temperature effects so that the permit would ensure that mortality is not induced from the long term influence of a thermal discharge. But EPA's analysis did not rely solely on these long term mortality effects. EPA also considered additional information about acute, short term effects. For example, information addressing avoidance of a species to certain water temperatures under much shorter time periods was also incorporated into a protective temperature for those life stages that were able to avoid the thermal plume (DD Section 5.6.3 and 5.7.3). This is clearly required in the case of the lower Charles River Basin in the vicinity of Kendall Station, where large changes in water temperature can occur several times within a 24-hour period as a result of the Station's heated discharge and operational profile.

Some of the literature and certain water quality regulations use a daily, or 24-hour average temperature value as a temperature limit for the maintenance of different life stages of fish species. Implicit in the use of such 24-hour average water temperatures is the assumption that the fish inhabits a water body with more or less natural thermal variance over the 24-hour period (perhaps 2 to 4 ºF changes over 24 hours). In the lower Charles River Basin, the significant impact of the Station's thermal discharge could cause pronounced short term swings in temperature beyond the natural variance that these 24

hour average measurements assume. This potential to spike temperatures in the lower Basin would be especially likely to occur if the Station operated near full capacity for a number of hours (high discharge temperature) and then operated at a reduced capacity (lower discharge temperature) in order to meet a 24 hour average temperature. EPA and MassDEP set the time interval for averaging temperatures at 4 hours so that the Station could not artificially cause temperature spikes in the lower Basin well above protective levels.

In addition, certain aspects of fish behavior vital to the maintenance of a suitable habitat and fish passage are not consistent with an extended (24-hour) average temperature limit. The avoidance behavior of a fish, for example, is not a reaction to a 24-hour average temperature, but a response to conditions the fish senses over a very short time period. For example, based on Mirant's shoreline sensing and pushnet datasets, alewife catch during some years was either zero or much-reduced at "instantaneous" temperatures greater than 81 ºF. The temperatures recorded during these studies were simple measurements of the water temperature at the time of the study. It would not be advised to extrapolate such short-term duration results to a 24-hour permit limit.

In conclusion, while longer term chronic laboratory experiments were one important factor in the examination of protective temperatures, the key support for a 4-hour average temperature limit is the realization that Kendall Station has the capacity to sharply raise temperatures in certain areas of the lower Basin over a relatively short period of time. The need for this protection against sharp temperature swings is especially evident when compared with the generally gradual changes in ambient temperature conditions used as a basis for laboratory experiments or state water quality criteria. Taking this potential into consideration, especially under low flow conditions, setting a compliance interval greater than 4 hours would not be protective of the BIP. Therefore, evidence from the river system was used to establish appropriate protective temperature limits and time periods.

M. Response to Comments Concerning the Future of Mirant Kendall Station

Comment M1: Due to adverse energy market conditions, Mirant Kendall has formally deactivated more than three quarters of Kendall Station's generating capacity as of October 1, 2004. Mirant Kendall has negotiated a cost-of-service agreement with ISO New England ("ISO-NE") and expects to operate Kendall Steam Unit Nos. 1 and 2 and Jet No. 1 under such agreement for a period of approximately one year. At the end of that one year period, it is anticipated that Kendall Steam Unit Nos. 1 and 2 and Jet No. 1 will be deactivated and Kendall Station will cease all electric production for an undefined period of time. Jet No. 2 has been retired and has been removed from the site. Accordingly, the Station is operating at less than a quarter of its generating capacity now, with current diminishment and eventual cessation of its cooling water discharge for an undetermined time. The Agencies should consider those circumstances in determining how quickly to proceed to issuance of a final renewal permit and how to schedule any new requirements in the permit.

Comment related to M1 from ECPT: As NSTAR will soon be able to provide all the electricity locally needed from its new substation on the Mirant site, we would prefer that no permit be issued.

Comment related to M1 from Rae Steining: The NEPOOL Reliability Committee has noted that NSTAR's objection to the deactivation of all power generation capability at Kendall would be moot once the construction of a new NSTAR substation on the Kendall site has been completed. The continued pollution of the Charles River by the Kendall Station cannot be supported on the grounds that operation of the station is required for reasons related to the reliability or cost of the local supply of electric power. I think it is best that no new discharge permit be approved. Instead, a temporary permit should be given to Mirant so that Kendall 1 and 2 steam turbines can operate until the NSTAR substation is ready for use. At that time, Mirant should cease production of electric power at Kendall.

Comment related to M1 from Dr. Stephen Kaiser: The Kendall plant is now being operated at only 35 MW – 15% of maximum capacity. This appears to be all the energy that Nstar needs and by next summer when the new transformer is complete, there will be no grid demand on Kendall. I support Rae Stiening's proposal that any comprehensive new permit should be deferred. Once Mirant (or any future owner) decides to restart major power generation they should reapply to EPA for a permit – for a plant that would be fully used.

Response to M1 and related comments: At this point, Mirant's plans for operation of the Kendall Station appear in flux. EPA does not believe that there is a basis for denying the permit entirely based on the operational status of the plant because the applicant has not abandoned its permit application or ceased power production. The permittee

submitted a letter to George Papadopoulos of EPA on June 2, 2005 which provided an update on the MKS operations for the foreseeable future. In its June 2005 letter, Mirant contended that it was likely that MKS will be mothballed, or put completely out of service, except for the production of steam, some time in late 2005 or 2006. However, Mirant allowed that there were contingencies which may necessitate the facility's operation beyond these dates and into the foreseeable future. In fact, since January of 2005, when Mirant had restarted its main generator, and through the summer of 2006 the facility has operated at moderate to high levels of capacity and is operational as of the date of this permit. Therefore, EPA is issuing this permit on the premise that generation at the facility would continue in the range of past generation levels.

The construction of a substation on the property has apparently been completed. This substation was put in place to alleviate transmission difficulties in the area of East Cambridge, which had led MKS to run as a "reliably must run unit" (RMR), as determined by ISO-New England. It is not clear when this substation will be fully operational and therefore it is not clear whether or not MKS will continue operating under its RMR status. At this time, it is not known whether it will be determined by ISO whether or not Mirant must enter into another agreement to run the facility. If the RMR contract is not extended or renewed, the permittee will likely be required to bid for power production in the open market with other power providers during the time period previously encompassed by the RMR contract.

If Mirant loses its RMR status, the plant will operate as a competitive supplier in the ISO energy market. The Station's viability will then depend on its ability to sell electricity at competitive rates. The proposed NPDES permit conditions are only one of many factors that would impact the plant's ability to compete in the New England power market.

Finally, EPA notes that Mirant Kendall's 2005 operations involved by far the highest thermal discharge in the plant's entire history. See Introduction to Section B and Responses to B1 through B3. This illustrates why EPA cannot confidently rely on Mirant Kendall's projections of its future electricity generation or thermal discharge.

Comment M2: Specifically, by a letter dated April 28, 2004 and its attachments Mirant Kendall notified the Agencies that it had filed applications in April 2004 with ISO-NE to deactivate Kendall Station. Under those applications, Mirant Kendall provided notice of its plans to deactivate all three steam units and the combustion turbine at Kendall Station effective October 1, 2004 and until further notice. By a letter dated June 24, 2004, ISO-NE approved the deactivation of one of the three Steam Units and concluded that the deactivation of the remaining two Steam Units "would place the loads served by [NSTAR's] Kendall Substation at risk until such time as [NSTAR's] proposed Kendall Substation distribution improvements are completed." These distribution improvements include the completion by NSTAR of a new substation that is under construction and is

scheduled to go into service during 2005. In its June 25, 2004 letter to Mirant Kendall, ISO-NE directed Mirant Kendall and NSTAR "to concur on the selection of two of the three [Steam Units] to remain in operation thus allowing the remaining [Steam Unit] to deactivate as requested." Mirant Kendall and NSTAR agreed that Steam Unit No. 3 is the Steam Unit that ISO-NE should approve for deactivation. By a notice to ISO-NE dated September 22, 2004, Mirant Kendall withdrew Steam Unit No. 3, effective October 1, 2004.

Response to M2: See Response M1 which describes a submittal from the permittee updating the permittee's latest understanding of future plant operations. Since there is the possibility that this facility will be operated to produce power in addition to steam through 2006 and beyond, this permit must be written to take this prospect into account unless and until Mirant withdraws its application to operate the facility at full capacity. See also Introduction to Section B and Responses to B1 through B3.

Comment M3: The total generating capacity of Kendall Station prior to the Section 18.4 proceedings was 283 MW at peak, of which 40 MW came from the two jets and the remainder came from the several units affecting the use and discharge of cooling water. As of October 1, 2004, Mirant Kendall is operating Kendall Station with a nominal generating capacity of only 61 MW at peak, comprising 19 MW from Steam Unit No. 1, 22 MW from Steam Unit No. 2 and 20 MW from Jet No. 1. As a result, Kendall Station's use and discharge of cooling water has been much reduced from its full operating capability.

Due to these deactivations, Kendall Station will not be operating during the foreseeable future at levels of electrical generation or cooling water discharges or impacts that are anything like the Agencies project in the permitting documents. Rather, the discharges for the balance of 2004 and into 2005 will be much more like the levels experienced at the facility prior to the upgrade. Once the Station is fully deactivated in the later part of 2005, for an indefinite time there will be no use or discharge of cooling water.

Response to M3: As explained in the responses M1 and M2, the permittee has changed its assessment of likely future operations at the facility and actually operated at a relatively high level during some periods in 2004 and 2005. The Final Permit has been written based on the application EPA has before it in which Mirant proposes that the facility will operate at moderate to high utilization levels.

Comment M4: Consequences of the Deactivations for the Renewal of the NPDES Permit. Due to the deactivations, there is no immediate need or justification for the Agencies to issue the final renewal permit. The expected operations into 2005, and the likely full deactivation in 2005, ensure that the Station will not have any increased impacts over what has occurred in the past without any apparent harm. That means that the Agencies should take the time to provide full consideration to the biological information Mirant Kendall has provided previously and with these comments, to the

results of the TMDL modeling discussed in other comments, and to the submissions Mirant Kendall is required to make under the new Phase II rules for cooling water intake structures.

In the event that the Agencies issue a final NPDES renewal permit to become effective at a time when Kendall Station is partly or fully deactivated, the Agencies should adjust the effective date of any major new requirements to account for the Station's reduced operations.

Response to M4: This comment effectively contradicts itself and leaves it to EPA to sort through the regulatory implications of the various options Mirant wishes to keep open concerning operation of this plant. On the one hand, Mirant declines to withdraw its application to discharge heat into the Basin at its full capacity, presumably anticipating the prospect that Mirant or a subsequent owner might find it profitable in the future to use the plant's full capacity. On the other hand, Mirant does not want EPA to issue a permit that addresses the full extent of the Station's potential heat discharge, presumably because the company prefers to avoid the increased compliance costs during a time when the currently prevailing economics of power generation mean that the plant will not be operating near full capacity.

EPA declines to further postpone this already long-delayed permit renewal, and the Agency has concluded that issuing the permit now is appropriate and necessary. Since the future prospects for how the Station might be operated are unclear, we will proceed to issue the permit for which Mirant applied so that it can be in place to address potential impacts at any level of operation, to collect important water quality and biological data, and to assess whether the BIP is being protected.

It is notable that Mirant's comments at no point commit the facility to limiting its capacity, and the company states that it does not want EPA to "shelve the permit renewal." So it is clear Mirant wants to receive a permit that authorizes and addresses the full range of Kendall Station's operating capacity. The practical result of Mirant's suggestion that EPA put off issuing this renewal is that the facility would continue to discharge under its existing permit, which allows for appreciable harm to the BIP. If Mirant believes that EPA should consider its reduced operations as a basis for narrowing or limiting the compliance requirements for the facility, EPA invites the company to submit an application for a permit modification under which the company agrees to take enforceable conditions limiting the capacity of the facility, along with a demonstration that those limits will assure compliance with WQS or a demonstration that they will protect the BIP.