UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION I
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MASSACHUSETTS 02109-3912

STATEMENT OF BASIS

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT MODIFICATION TO DISCHARGE TO WATERS OF THE UNITED STATES PURSUANT TO THE CLEAN WATER ACT (CWA)

NPDES PERMIT NUMBER**: MA0004898**

PUBLIC NOTICE START AND END DATES: October 25, 2010 – November 23, 2010

NAME AND MAILING ADDRESS OF APPLICANT**:**

Mirant Kendall, L.L.C.
1099 Hingham Street
Rockland, MA 02370

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS**:**

Mirant Kendall Cogeneration Station
265 First Street
Cambridge, MA 02142

RECEIVING WATER(S**): Charles River and Broad Canal**

RECEIVING WATER CLASSIFICATION(S**): Class B - Warm water fishery**, **Restrictions: CSO**

SIC CODE: 4961

CURRENT PERMIT - ISSUED: September 26, 2006; **APPEALED:** October 30, 2006

MODIFIED: December 18, 2008; **APPEALED:** February 2, 2009

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I. Summary of Proposed Action

EPA is proposing a modification to the Final Permit issued by EPA Region 1 to Mirant Kendall Station on September 26, 2006 (the Final Permit or the 2006 Final Permit). The Final Permit has yet to take effect because in October 2006, both the permittee (Mirant Kendall) and the Conservation Law Foundation (CLF), with Charles River Watershed Association (CRWA) as co-petitioner, petitioned EPA's Environmental Appeals Board (EAB) in Washington, D.C., for review of the Final Permit.

This modification concerns the major changes that the permittee is proposing for its facility which will substantially reduce the intake of cooling water from the Broad Canal and result in a commensurate reduction in the volume and heat load associated with the effluent discharged to the Charles River.

A. Background

1. 2006 Permit, 2008 Modification, and Ongoing Appeal

The Final Permit included both thermal discharge limits imposed under Clean Water Act (CWA) § 316(a) and cooling water intake structure (CWIS) requirements imposed under CWA §§ 316(b), 301(b)(1)(C), and 401(a)(1) and (d). In October 2006, both the permittee (Mirant Kendall) and CLF, with CRWA as co-petitioner, petitioned EPA's Environmental Appeals Board (EAB) in Washington, D.C., for review of the Final Permit. Following a decision of the United States Court of Appeals for the Second Circuit and EPA's subsequent suspension of a regulation upon which the Final Permit had been partly based, the Region requested (and the EAB granted) a stay of proceedings so that it would withdraw the provisions of the 2006 Final Permit that were informed by the suspended portions of the regulation and prepare a permit modification to address the withdrawn permit provisions.

A permit modification was issued on December 18, 2008 containing specific requirements related to Kendall Station's cooling water intake structures (CWISs) which established requirements designed to minimize both entrainment and impingement mortality of fish. The biological data indicates that, under current operation, Kendall Station's CWISs entrain significant numbers of fish eggs and larvae on a seasonal basis (from approximately April through July). At that time, the technological data indicated that screening systems exist that should be able to reduce entrainment while also allowing the organisms blocked from being entrained to escape the screening system without suffering impingement mortality. The permit modification required, among other things, the use of an aquatic organism exclusion technology meeting certain technical design standards (*e.g.*, a maximum screen opening or pore size) that should minimize entrainment (the "primary BTA technology). The permit modification further sought to minimize impingement mortality by requiring that whenever the primary BTA technology is not in place and functioning properly, the permittee must implement a coarse-mesh barrier net system meeting certain design criteria geared to minimize impingement mortality (the "secondary BTA technology"). The permit modification

further required that whenever neither the primary BTA technology nor the secondary BTA technology are in place and functioning properly, the permittee must operate the existing traveling screens in a manner intended to minimize impingement mortality (the "tertiary BTA technology").

On February 3, 2009, Mirant Kendall appealed the 2008 permit modification to the EAB.

2. Discussions Regarding Further Permit Modification

As EPA was completing the 2008 permit modification, the parties (Mirant Kendall, EPA, MassDEP, CLF, and CRWA) began discussing a potential facility upgrade and accompanying NPDES permit modification that could resolve the appeal. The parties requested (and the EAB granted) a stay of proceedings to explore settlement, and, over the course of 2009 and 2010, the EAB extended this stay at the parties' request on several occasions. This proposed permit modification is the outcome of these settlement discussions.

3. Current Proposed Permit Modification

On October 15, 2010, Mirant Kendall submitted to EPA a formal request for a permit modification. The request included an explanation of Mirant Kendall's proposed upgrade and post-upgrade operations, and of why Mirant Kendall believes a modification is appropriate. The request also included, as an attachment, a proposed permit modification, which forms the basis of this draft permit modification.

Although this new draft permit modification is formally a modification of the 2006 Final Permit, rather than a new draft permit, it replaces many of the provisions of both the 2006 Final Permit and the 2008 modification, and therefore effectively supersedes them. The permittee's proposed reductions in pollutant discharges and intake water volume have been determined to meet Best Available Technology, CWA § 316(a) variance, and Best Technology Available requirements. Therefore, many of the thermal control provisions of the 2006 Final Permit, and the screening technologies and related measures required by the 2008 modification, are not needed anymore and have been removed from the permit and replaced with new provisions.

II. Permit Modification and Basis

A. Current Facility Operation

Water needed to cool and condense steam exiting the Facility's turbines is withdrawn from the Broad Canal, which is a channel connected to the Charles River, through three permitted intake structures. This cooling water is circulated through the Facility's three condensers, where the heat from the condensers is transferred to the water. This heated water is eventually discharged to the Charles River.

The Facility's CWISs include a multi-tiered system of screens designed to minimize the amount of debris entering the Facility. The existing intake water (approach) velocities range from approximately 0.8 to 0.9 feet per second (fps) at the intake screens (Alden Research Laboratory, November 21, 2007). There are two intake water screen houses, with one housing 2 CWISs and the other housing the third CWIS. Six pumps (each capable on average of producing a flow of approximately 13 million gallons per day (MGD)) are used to control flow of the cooling water through the screen houses and to the condensers, two per CWIS and condenser. The Facility does not have variable control speed pumps but rather can regulate flow by turning on or off any sequence of pumps. Each intake structure includes a trash rack and traveling screen. The trash racks are located across the three six-by-ten-foot inlets along the Broad Canal; their steel bars are spaced three inches apart and collect large debris such as plastic and wood fragments that may be in the intake water.

Located downstream of the trash racks are the traveling screens that intersect each intake's cross-sectional area. The traveling screens are divided into six-foot-by-one-foot panels and are located perpendicular to the flow of the water. The screen mesh size is three-eighths (3/8) of an inch. This mesh size is too large to prevent the entrainment of any fish eggs or larvae, or other tiny organisms, present in the water withdrawn for cooling. The traveling screens are rotated three times per day and cleaned with river water that is returned to the Broad Canal. Any fish or debris caught on the screens is placed in a holding bin and eventually disposed of so that impingement mortality is 100%.

B. Proposed Facility Operation

Mirant has proposed to make significant changes to its facility which will allow it to produce considerably more steam for sale than it is currently producing. This will eventually result in a significant reduction in the withdrawal of water from the Lower Charles Basin as well as a commensurate reduction in the heat load discharged from the facility. This is also expected to result in indirect air quality improvements as Kendall Station's steam sales into Boston may replace steam that is currently supplied by other sources (e.g., older, less-efficient boilers) that have higher air emissions than Kendall Station. Mirant's plan relies on the construction of a new steam pipeline to be constructed along the Longfellow Bridge, which will be owned and operated by Trigen-Boston Energy Corporation, or "Trigen."[1] Mirant has determined that the construction and operation of a back pressure steam turbine (BPST) and an air cooled condenser (ACC), in conjunction with the proposed steam pipeline, will allow it to sell up to twice as much steam as it is currently able to.

Since the construction and operation of the steam line along with the BPST and ACC are multi-year projects, the parties have discussed, and EPA plans to issue, an administrative compliance order which will set timelines for construction and operation of the BPST and

[1] The Trigen steam line will be built in coordination with the Massachusetts Department of Transportation's Longfellow Bridge Rehabilitation Project. For more information on that project, see: http://www.massdot.state.ma.us/Highway/abp/longfellow.aspx.

ACC, and establish interim permit limits and conditions. The final compliance order would not be issued until after this permit modification has been finalized, and is not part of the comment process for this draft permit modification.

Once the facility upgrades have been completed and Mirant is selling steam as planned, it expects that the non-contact cooling water flow will be reduced from a daily maximum of 80 MGD to 3.2 MGD, which represents a reduction of over 95%. The through-screen velocity at the intake screens would also be reduced to 0.5 feet per second or less. Mirant also expects the heat load to be reduced from the currently permitted 13,344 million (mm) BTUs/day to a maximum of 534 mm BTUs/day, a decrease of more than 96%. Moreover, according to Mirant, these upgrades will allow Kendall Station to operate more economically, by allowing Kendall Station to sell up to twice as much steam into Boston as is currently possible. Mirant has proposed, and EPA agrees, that these reductions represent the Best Technology Available (BTA) for minimizing adverse environmental impacts from the impingement and entrainment of fish as required under Section 316(b) of the CWA, and the Best Available Technology (BAT) for controlling the discharge of heat, as required under Section 301(b) of the CWA.

However, even after installation of this technology, the Station's discharge would cause certain portions of the Lower Charles River Basin to exceed the in-stream temperature criteria of the Massachusetts water quality standards (83 ˚F for Class B waters). Therefore, the permittee has requested a variance from this water quality standard under Section 316(a) of the Clean Water Act.

The permittee has also requested that the permit provide alternate technology-based limitations under Section 316(b) during certain operational conditions. According to the permittee, while the BPST and ACC are reliable technologies, industry experience regarding this type of equipment indicates the need for occasional planned shutdowns of the BPST and ACC to conduct preventive maintenance or repairs, as well as occasional shutdowns for unplanned repairs. These conditions would be characterized as either Planned Maintenance Operations (PMO) or Unplanned Repair Operations (URO). PMO occurs when the permittee would conduct scheduled maintenance for the BPST, the ACC, and/or any steam line from the site which would necessitate open-cycle operations with intake and discharge flow of 52.2 MGD (and concomitant increase in total heat load to the river). URO occurs if there is an unexpected failure of a component of the BPST, ACC, and/or the steam line from the site, which would require a similar shutdown of a major system component as with the PMO, but without the advanced knowledge of such an event. In order to account for these conditions, the permit will allow for operations under either of these scenarios which would allow for the intake and discharge of up to 52.2 MGD under specified limited circumstances.

The permittee may operate under a PMO only for the time period and duration specified in the draft permit and may not conduct PMO for more than a total of 30 days out of any rolling five-year period. See Part I.A.11.b. of the draft permit modification for other requirements related to PMO operations. Under URO, the permittee would be authorized to continue operating the Facility, resulting in the discharge or withdrawal in excess of

3.2 MGD, due to the unplanned unavailability (for physical, technical, and/or safety reasons) of the BPST, the ACC, and/or the steam line. The permittee shall not withdraw water through any of the CWISs under Part I.A.11.c for more than a total of 30 days out of any rolling five-year period. See Part I.A.11.c of the draft permit modification for other requirements related to URO operations. In addition, any time the facility operates under PMO or URO, the draft permit modification includes specific technology-based permit provisions related to the operation of the CWISs in compliance with CWA § 316(b).

As previously indicated, the BPST/ACC technologies include, as an inherent limitation in the technologies themselves, the occasional necessity for planned maintenance and/or unplanned repairs. Because of this, EPA has determined that, at a maximum daily intake of 52.2 MGD, and in combination with the limitation on total number of days of PMO/URO operation, the requirements associated with intake velocity and screen rotation, inspection, and handling of live fish during PMO/URO operation, as specified in Part I.A.11.d of the draft permit, are consistent with BTA to reduce impingement mortality at the CWIS.

C. Section 316(a) Variance and Thermal Limits

Under CWA § 316(a), if a permittee can demonstrate to the satisfaction of EPA that a technology-based or water quality-based effluent limit for heat is "more stringent than necessary to assure the projection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made," then EPA may impose an alternate heat effluent limitation "that will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on that body of water." 33 U.S.C. § 1326(a).

The 2006 permit contained end-of-pipe thermal limits and enforceable in-stream thermal limits that were based on a § 316(a) variance designed to maintain a zone of passage and habitat protective of a balanced, indigenous population (BIP). *See* "Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Mirant Kendall Station in Cambridge, MA" ("Determination Document"), *available at* http://epa.gov/ne/npdes/mirantkendall/assets/pdfs/draftpermit/Kendall_Determin-Doc_06_08_04.pdf. At that time, EPA concluded that the need to discharge more heat than would be allowed by setting end-of-pipe limits protective of in-stream temperatures required a more complex and innovative thermal monitoring regime than is typical of NPDES permits in order to support a BIP, as required under § 316(a). In this modification, EPA has not changed the end-of-pipe thermal limits or in-stream thermal endpoints from the 2006 permit because they were based on an extensive analysis of the thermal requirements of the BIP. However, because the proposed changes to the operations at Mirant Kendall will reduce the discharge volume and heat load to the river, the thermal impacts of the discharge are not expected to be as detrimental as the impacts under current (pre-upgrade) operating conditions. The end-of-pipe thermal limits in the 2006 Final Permit (105° F, with a 20° F facility temperature rise) at the reduced volume are expected to maintain protective in-stream temperatures under most circumstances, but

there will be circumstances under which Kendall Station's discharge, even at lower levels, has the reasonable potential to cause or contribute to an exceedance of these protective in-stream temperatures. Mirant proposes, and EPA agrees, that further temperature restrictions should be based on an in-stream temperature measurement and compliance mechanism, similar to (but less complex than) the mechanism in the 2006 Final Permit.

The draft permit modification proposes a less complex and intensive monitoring regime based on the use of a temperature grid that predicts afternoon river temperatures based on morning intake temperatures. This approach employs a predictive approach regarding whether the in-stream temperature limits are expected to be met and determines if the permittee is required to monitor river temperature on a given day. To be clear, this permit modification does *not* alter the biologically-based in-stream temperature endpoints set forth in EPA's 2006 permit, but rather provides a simpler, less expensive compliance mechanism to ascertain whether the facility's (now greatly reduced) discharges are achieving those endpoints.

1. Summary of Compliance Mechanism

The 2006 Permit defined seasonal protective maximum temperatures (known as the Maximum Temperature Limits, or MTLs), at an extensive array of points (eight locations and approximately four depths at each location) in the Charles River, and then required real-time in-stream compliance monitoring at each of those points.[2] The currently proposed operation (including use of an ACC and BPST) will drastically reduce the heat load to the Charles River. As such, EPA believes that the in-stream thermal limits will likely be met much of the time, and intensive real-time monitoring is no longer necessary.

Instead, EPA has developed a new framework to direct in-stream monitoring (see Attachment D of the permit modification). While the resulting mechanism still has many complex elements, it is in most respects simpler than (but just as protective as) operating a network of in-stream real-time monitoring stations.

The draft permit modification retains the MTLs as the in-stream temperature endpoints that constitute protection of the BIP. EPA has developed a simple but conservative model (in the form of a grid) to predict, given morning temperatures and river flows, whether in-stream temperatures may approach the MTLs during the hottest part of the day (the afternoon). Each day, Mirant must consult the grid based on the morning's river temperature and river flow. If the grid predicts that afternoon temperatures may approach the MTLs, then Mirant must conduct in-stream temperature monitoring that afternoon to determine if there is actually an exceedance. Such an exceedance constitutes a permit violation unless Mirant can demonstrate that one of several precisely defined exceptions applies. In addition, the permit also contains a "failsafe" condition under which Mirant will curtail operations if there are several consecutive days of high temperatures. Details of this approach are discussed below.

[2] See Determination Document at 122-170.

2. Selection of compliance monitoring location (Monitoring Station 3)

As noted above, the extensive modifications associated with the proposed operation of the ACC and BPST are expected to result in a 95% reduction in intake water and 96% reduction in heat load to the Charles River. Given that these reductions will likely lead to improvements in water quality and habitat, EPA examined surface temperatures recorded at several monitoring locations during 2008 to determine if attainment of the protective in-stream temperatures in the 2006 Permit could be ensured by measuring at a single location.

Of the four monitoring locations downstream of the Harvard Bridge (Boston, Longfellow, Museum, and Dam), the Boston thermistor consistently recorded the highest maximum daily 4-hour average, and would have consistently captured a maximum daily 4-hour average temperature in exceedance of the proposed in-stream thermal limits when any other monitoring location also recorded an exceedance if these limits were effective in 2008. EPA concludes that a location near the Boston thermistor would be a suitable monitoring location to use as a proxy for the rest of the monitoring locations in order to determine if the facility is meeting in-stream thermal limits. The modification applies the numeric, in-stream thermal limits from the 2006 permit at one location (Monitoring Station 3) near the Boston Thermistor, but also requires additional supportive and supplemental monitoring at several additional locations to ensure that Station 3 accurately reflects temperatures in the Lower Basin.

3. Calculation of Predictive Temperature Grid (Attachment D)

As noted above, the draft permit modification's compliance mechanism requires Mirant to consult a grid that is designed to predict whether the in-stream temperatures are likely to approach or exceed the MTL. To develop this grid, EPA used existing in-stream temperature and facility heat load data to model afternoon river temperature based on the morning intake temperature at the CWIS. EPA calculated a predicted afternoon temperature in two stages: (1) a standard increase to model the increase in intake temperature from 9:00 AM to 2:00 PM, and (2) the difference (delta T) between the observed temperature at the Boston thermistor and the temperature at Mirant Kendall's intake based on temperature and heat load data between 2003 and 2008. The underlying assumption was that, if reliably defined, the relationship between the morning intake temperature and the afternoon river temperature could be used to predict whether the facility would exceed in-stream compliance temperatures on a given day. In turn, this prediction determines whether afternoon in-stream monitoring is required on a given day. As a conservative measure, in-stream monitoring is triggered when the afternoon temperature is expected to be within 2˚F of the MTL. Conversely, if the afternoon temperature on the Boston side is predicted to be cooler than the MTL by more than 2˚F, in-stream monitoring is not required.

4. In-stream Temperature Compliance Requirements

The in-stream temperature compliance requirements are contained in Part I.A.1 footnote 7 and Attachment A. Broadly speaking, Attachment A defines certain key terms, and Part I.A.1 footnote 7 provides the operational conditions. Briefly, the in-stream temperature compliance requirements are designed to prohibit Kendall Station from discharging heated effluent that causes, or contributes to, an exceedance of protective in-stream temperature endpoints. The central element of the compliance requirement is a prohibition on discharge of heated effluent unless MTLs are attained at all depths at Monitoring Station 3. However, the permit modification contains a set of carefully circumscribed exceptions through which the permittee can demonstrate that, despite a measured exceedance of an MTL at Monitoring Station 3, Kendall Station did not cause or contribute to that exceedance,[3] or (for other exceptions) the exceedance is still consistent with protection of the BIP. Very briefly (and as explained in more detail below), those exceptions are:

i. *The "upstream/downstream exception."* Natural variability can result in the river already exceeding MTLs even without Kendall Station's discharge. In some cases this can occur throughout the river; in other cases, upstream conditions (as measured at the B.U. Bridge) may fall below the MTL but temperatures near Monitoring Station 3 can be warmer due to natural variability. This could potentially result in an exceedance of the MTL at Station 3 that may not be attributable to the facility's discharge. Therefore, the draft permit modification allows the measured temperature at Station 3 to exceed the MTL if Mirant can demonstrate that the Station 3 temperature does not exceed the upstream temperature plus an "upstream/downstream buffer" (which varies depending on circumstances, but is typically 1.0° F) to account for natural upstream/downstream variation.
ii. *The "cross-transect exception."* Natural variability can also result in the temperature at Monitoring Station 3 (on the Boston side of the river) being warmer than the temperatures closer to the Cambridge side of the river (where Kendall Station discharges). In other words, it is possible that Kendall Station's thermal plume might dissipate mid-river, yet due to entirely unrelated circumstances, the Boston side of the river could be warmer than the MTL. This could potentially result in an exceedance of the MTL at Station 3 that may not be attributable to the facility's discharge. Therefore, the draft permit modification allows the measured temperature at Station 3 to exceed the MTL if Mirant can

[3] To be clear, the draft permit modification does not rely on case-specific demonstrations as to whether Kendall Station's discharge did or did not "cause or contribute to" a particular in-stream temperature exceedance. Rather, in developing the draft permit modification, EPA has defined precise exceptions to the general prohibition on discharge of heat, whereby certain categories of in-stream temperature exceedances are excepted because of insufficient certainty that exceedances in that category would be caused or contributed to by Kendall Station's discharge. By contrast, in-stream temperature exceedances that do *not* qualify for one of the defined exceptions are, *per se*, permit violations.

demonstrate that mid-river temperatures do not exceed the MTL (or, if higher, the background temperature).

iii. *Deep measurement exceptions.* The draft permit modification allows the deepest monitoring point (24-foot depth) to exceed the MTL when it is unlikely to be used as habitat due to low dissolved oxygen, or during the winter when a type of unique "reverse" thermal stratification may occur.

iv. *Springtime exceptions.* As in the 2006 permit, the draft permit modification recognizes that temperatures can vary widely during the spring, and allows the permittee to exceed applicable temperatures up to six times during the period of April 15 to June 7.

These exceptions are discussed below in more detail.

i. Upstream/Downstream Exception

In a November 24, 2009 email, Mirant stated that, based on historical data, "differences of 1° F or more between background temperatures and Station 3 were not uncommon even with zero thermal discharge." Consequently, Mirant requested that a buffer be built into the permit that would provide that certain small exceedances of the MTL at Station 3 would not constitute permit violations. This buffer would account for natural sources of variability in the river that could cause the temperature at Station 3 to exceed the MTL without the contribution of the thermal discharge from Outfall 001 of the facility.

EPA recognizes that natural variability between the upstream Station 1 (near the B.U. Bridge) and Station 3 could potentially result in an exceedance of the MTL at Station 3 that may not be attributable to the facility's discharge. To this end, EPA proposes that when the temperature at Station 3 is above the MTL, the applicable temperature limit shall be the background temperature (i.e., the corresponding-depth temperature at Station 1), plus an "upstream/downstream buffer" that, under most circumstances, is 1.0° F. EPA believes a 1.0° F buffer is appropriate because, based on analysis of the differences between Mirant's Harvard Bridge Station and a location upstream of EPA's Station 3 (Mirant's Boston location) at times when the facility was not operating, a 1˚F buffer sufficiently encompasses the natural variability between the two monitoring locations. Thus, if the Station 3 temperature is within 1˚F of the Station 1 temperature, the facility is not in violation of the permit. If the Station 3 temperature is 0.4° F above the MTL, but the Station 1 temperature is 0.6° F below the MTL, then the Station 3 temperature is meeting its applicable temperature limit because it is within 1.0° F of the Station 1 temperature. In other words, the applicable temperature limit at Station 3 is the MTL *or* the Station 1 temperature plus 1.0° F, whichever is greater.

The upstream/downstream buffer is 1.0° F under most anticipated circumstances. A 1˚F buffer adequately captures the natural variability between the monitoring stations in the permit. To be specific, based on present information, EPA is *not* stating that any Station 3 MTL exceedances that are within 1° F of the Station 1 temperature are necessarily protective, *nor* that such exceedances are not attributable to Kendall Station's discharge. Rather, for any given Station 3 MTL exceedance that is within 1° F of the Station 1

temperature, there is insufficient certainty (based on present information) that such an exceedance would be wholly or partly attributable to Kendall Station's discharge. For this reason, with a few exceptions, Station 3 temperatures that are within 1° F of the corresponding-depth Station 1 temperature qualify for this exception. On the other hand, present information suggests that differences above 1˚F are sufficiently likely to be wholly or partly attributable to effects of the plant's heated effluent that, in the context of the entire permit scheme and absent another exception provided by the permit itself, it is appropriate for the permit to provide that any Station 3 exceedances that are more than 1° F above the Station 1 temperature are (absent another applicable exception) *per se* permit violations on days when Mirant Kendall is discharging heat.

As noted above, the upstream/downstream buffer is normally 1.0° F. However, there are two potential instances that may occur within the Chill Period (November 1 through March 29) where the exception has been increased to 2.0° F. Both these instances allow for an increased buffer to account for natural variability during a mild late fall/early winter that could result in higher temperatures at Monitoring Station 3 independent of Kendall Station's thermal discharge. In this case, EPA believes a 2.0° F buffer is appropriate because, based on an analysis of Kendall Station intake water temperatures from 1994 through 2002 (Kendall Station Determination Document; Figures 5.9.2-15 to 5.9.2-23) ambient water temperatures in the Charles River were sometimes seen to remain above a temperature of 50° F during the onset of the Chill Period or be slightly below 50° F and then increase above 50° F during a mild weather pattern. An addition of 1.0° F to the exception of 1.0° F is still protective of the BIP when water temperatures are cool and uniform in the lower Basin. The additional 1.0° F buffer provides the Facility with some operational flexibility when the ambient river temperature has exceeded the maximum temperature in effect for the chill period, without diminishing protection of the BIP.

Finally, certain ambient river conditions can create a scenario where protection of the BIP requires no upstream/downstream buffer. This occurs when dissolved oxygen (DO) values at Station 1 measured at 2 feet and 6 feet, as well as the Station 3 DO values at 2 feet and 6 feet are *all* below 5.0 mg/l. DO values below 5.0 mg/l do not meet Massachusetts Water Quality Standards and are below levels considered suitable for fish habitat. EPA believes that addition of 1.0° F above the Station 1 temperature is no longer appropriate under these extreme conditions, when a large part of the lower Basin is exhibiting depressed DO conditions that are stressful to the balanced indigenous fish population.

On a final note, as stated above, the 1° F buffer and other temperature exceptions included in the draft permit, are based on a review of presently available data comparing Mirant's Harvard Bridge Station to Mirant's Boston thermistor as well as historical intake water temperature data from the Facility. Analysis of data collected under the permit's Supplemental In-stream Temperature Monitoring program (including any data voluntarily collected by Mirant pursuant to the same protocols provided by that program) may justify an adjustment to this buffer in the future.

ii. Cross-Transect Exception

If an exceedance at Station 3 does not qualify under the "upstream/downstream" exception, Mirant may attempt to demonstrate that the cross-transect exception should apply by measuring the temperature at mid-river locations. Mirant must measure the corresponding depths at each of Monitoring Stations 4 and 5 (and, for Monitoring Points 12 feet and deeper, Monitoring Station 6), and select the highest. For example, if the temperature at the 12 foot depth at Monitoring Station 3 exceeds the MTL and also exceeds the upstream temperature by more than the "upstream/downstream buffer," then the temperatures at the 12-foot depth at each of Monitoring Stations 4, 5, and 6 would be compared. The highest of these three temperatures would constitute the "Highest Cross-Transect Temperature" for that depth. The Highest Cross-Transect Temperature would then be compared to the MTL and the upstream temperature for that depth. If the Highest Cross-Transect Temperature does not exceed the MTL, then the middle portion of the river is at a protective temperature, and the exception applies, because the BIP is protected notwithstanding the Station 3 exceedance. Alternatively, if the Highest Cross-Transect Temperature exceeds the MTL but does not exceed the upstream temperature for that depth, then the middle portion of the river near Kendall Station's discharge is no warmer than the upstream temperature, and any exceedance on the Boston side is not attributed to Kendall Station's discharge.

iii. Deep Measurement Exceptions

Two exceptions may apply for the 24-foot depth: one dependent on dissolved oxygen, and one seasonal. First, the draft permit modification allows the deepest monitoring point (24-foot depth) to exceed the MTL when it is unlikely to be used as habitat due to low dissolved oxygen. This provision follows reasoning included in the 2006 permit. It is based on the premise that a zone of depth in the lower Basin, no matter what the temperature, is not considered to be suitable habitat when the accompanying DO is less than 5.0 mg/l (the Massachusetts Water Quality Standard for DO). Areas of low DO may cause fish to abandon that habitat or become stressed if they remain. This degraded habitat does not support a balanced indigenous population, so it is specified as a deep water exception when the accompanying temperature exceeds the MTL.

The second type of exception is only allowed under certain circumstances during the late fall/early winter season, when a type of unique thermal stratification may occur. This "reverse thermal stratification" is characterized by relatively warm (above 50° F), dense, saline water from Boston Harbor, which seeps into the lower Basin through the New Charles River Dam and Locks and sinks to the deepest portions of the river bed. When a large enough volume of this dense water enters the Basin, depths up to 24 feet may be affected. Cold (below 50° F), but less dense fresh water flows downstream from the Charles River Watershed and "floats" at shallower depths on top of the dense saline lens. In this case, the warm deeper water is a result of the site-specific hydrologic conditions of the lower Basin. Kendall Station's thermal discharge does not contribute to the elevated temperatures of this deep water, so an exception is allowed when this warm, dense water reaches 24 feet and exceeds the MTL.

iv. Springtime Exceptions

These are carried forward from the 2006 permit. While their implementation has been translated into the compliance mechanism of this draft permit modification, the definitions of the springtime exceptions, their applicability, and their justification have not changed from those set forth in the 2004 Draft Permit Determinations Document (pp. 169) and need not be repeated here.

5. Failsafe condition

The draft permit modification also contains a "failsafe" condition proposed by Mirant to ensure that consecutive warm days do not result in an unacceptable condition. The failsafe condition is triggered when three criteria apply for each of two consecutive days:

1. The facility discharged heated effluent.
2. The permittee was required to conduct compliance temperature monitoring (either because the predictive grid predicted warm temperatures, or because the facility was operating under open-cycle conditions) and the temperature at Station 3 at any depth exceeded the applicable temperature limit by more than 0.5° F.
3. The temperature at Station 3 exceeded Kendall Station's intake temperature by more than 1.0° F (with both the intake and the Station 3 temperatures for this purpose being measured as vertical averages of afternoon temperatures).

If all three criteria are true for both days, then the facility will not discharge any heated effluent at all on the third day. This failsafe condition supplements the core in-stream temperature compliance mechanism and helps ensure protectiveness.

6. In-stream Temperature Monitoring

i. In-stream Temperature Monitoring Under BPST and ACC Operation

Several key operational aspects of Kendall Station justified the continuous, real time in-stream temperature monitoring required in the 2006 permit. The rationale supporting the extensive in-stream temperature monitoring is fully discussed in the 2004 Kendall Station Determination Document at pp. 149-160. One supporting example is given here. The proposed maximum daily water withdrawal at Kendall Station under the 2006 permit was limited to 80 MGD, which is approximately 123 cfs, resulting in a heat load discharge of 556 MMBTU/hour. The average flow of the Charles River near the station is 113 cfs in August, and the low flow, 7Q10 value for the lower Charles River Basin is approximately 22 cfs. Kendall Station's discharge, under these flow profiles and expected heat load, was likely to be a major thermal influence in the lower Basin that could quickly modify the thermal profile of the lower Basin. The volume of the thermal plume was documented to reach as far upstream as the Harvard Bridge. A real-time temperature monitoring system in the river was deemed the best way for Kendall Station to maintain a degree of

operational flexibility while also providing a mechanism to ensure that fish passage and suitable fish habitat were maintained.

In addition, at the time the permit was written, a validated thermal model of the lower Basin was not available. Only a limited amount of river temperature data from a few in-stream locations and depths was available. The data were insufficient to predict river temperatures in one part of the Basin based on temperatures at another location. EPA determined that a minimum of nine fixed in-stream monitoring stations were required to monitor the thermal plume continuously to ensure that protective in-stream temperatures were maintained.

Under the provisions in this draft permit modification, Kendall Station's BPST and ACC operational profile will be very different. A 3.2 MGD intake flow limit represents a reduction of over 95% from the 2006 permit. The heat load is expected to decrease more than 96%. Coupled with these dramatic operational changes, the permittee submitted additional continuous temperature data from areas in the lower Basin. The analysis of these data sets has allowed EPA to better understand the thermal interactions of the lower Basin when the Facility operated at lower levels.

The large reduction in heat load has greatly reduced the potential for the Facility's discharge to raise temperatures throughout the Basin, especially within a short time period. This has allowed EPA to remove the requirement for real-time, continuous, fixed temperature monitoring stations.

EPA has analyzed supplemental temperature data from the Basin and identified two key representative temperature monitoring locations needed to monitor the thermal profile of the Basin when Kendall Station is withdrawing river water at a rate of 3.2 MGD. EPA has reduced the number of monitoring locations from nine to two when the Facility is operating at this level. Station 1, the upstream station below the B.U. Bridge will serve as the ambient river temperature, or background station. This station location is similar to the Station 1 described in the 2006 permit (Permit Attachment B). Station 3 is also retained as part of the draft permit. This station, nearest to the Boston shore and downstream of the facility's discharge, is placed in a similar location to Station 3 as described in the 2006 permit (Permit Attachment B).

ii. Compliance Support and Supplemental Temperature Monitoring

EPA has identified Station 1 and Station 3 as the two representative locations needed to determine permit compliance in the lower Basin under expected conditions. With temperature information from only these two stations, EPA must assume that the discharge from Kendall Station has the characteristic of a "text book" thermal plume. The plume is expected to move downstream and spread out from the Cambridge side of the river to the Boston side of the river. Water temperatures are expected to diminish as the plume moves downstream and across the river.

However, EPA recognizes that:

(1) The Charles River lower Basin is a dynamic water body. The river temperature data sets analyzed do not reflect river temperature conditions under all meteorological and hydrologic events. Basin conditions will not always allow the thermal plume to follow a "text book" pattern.
(2) Other heat sources (solar, runoff water, other discharges) may warm the Boston side of the river independent from the impact of Kendall Station's thermal plume.
(3) There is no long term historical record of Kendall Station operation at 3.2 MGD to assist in refining the temperature projections.
(4) Planned Maintenance Operations (PMO) and Unplanned Repair Operations (URO), although relatively brief in duration, will increase the cooling water intake flow to 52.2 MGD and increase the heat load from approximately 22 MMBTU/hr to approximately 363 MMBTU/hr. There is insufficient in-stream historical temperature data to predict the nature of the thermal plume under these operating conditions.

In order to reduce the degree of uncertainty presented by the factors above, EPA has required that when compliance temperature monitoring is required by provisions in the draft permit, compliance support monitoring or supplemental temperature monitoring shall also be conducted as specified in the permit. This additional monitoring at Stations 2, 4, 5, 6, 7 and 8, will verify the temperature relationships predicted using historical data, more precisely demarcate the thermal plume, provide data needed to evaluate whether Kendall Station's thermal plume caused or contributed to the temperature exceedance at Station 3 and document whether sufficient fish passage and suitable fish habitat are present in the lower Basin.

7. Other changes

Attachments A, B, D, and G are being modified. Attachments E and F are no longer necessary and have been reserved. Attachments H and I are no longer necessary and have been eliminated. Attachment C is not being modified.

Minor changes to permit modification:

The fish mortality requirements of Part I.A.12 have been revised. Instead of the observance of one dead fish triggering the periodic inspection of the Broad Canal and discharge area, this has been changed to three fish.

The permit limits at Part I.A.2 have been changed to require screen wash water to be monitored once per month at each traveling screen instead of when in use. The flow limit has been changed from a monthly average to a daily maximum of 0.1 MGD to be consistent with the description in the heading of this Part.

A requirement has been added to Part I.A.13 of the permit regarding unusual impingement events (UIE) which requires the permittee, upon the occurrence of a UIE, to rotate all traveling screens once every hour until the impingement rate falls below 15 fish per hour.

The Quality Assurance Project Plan (QAPP) requirement in Part I.A.14.d.3 has added clarification that it applies only to all instream monitoring data. This was believed to be the original intention of this requirement. The permittee shall also provide its methods for calibrating the equipment that measure its influent and effluent temperature.

Language has been added to Part I.A.14. e. regarding the instream total residual chlorine (TRC) monitoring which specifies that this monitoring needs to be conducted only for those months that chlorination occurs and that such sampling be conducted within one (1) to eight (8) hours of chlorination.

The monitoring frequency for certain parameters in Part I.A.3 has been changed from daily to weekly.

Part I.B. has been revised to include language which requires the permittee to begin using a web-based reporting system called "NetDMR" to electronically submit monitoring results within a specified time frame. This language also provides opt-out language if the permittee is unable to use NetDMR.

III. Essential Fish Habitat Determination (EFH)

Under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801 et seq. (1998)), EPA is required to consult with the National Marine Fisheries Services (NMFS or NOAA Fisheries) if EPA's action or proposed actions that it funds, permits, or undertakes, may adversely impact any essential fish habitat such as: waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. § 1802 (10)). Adversely impact means any impact which reduces the quality and/or quantity of EFH (50 C.F.R. § 600.910 (a)). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

Essential fish habitat is only designated for species for which federal fisheries management plans exist (16 U.S.C. § 1855(b) (1) (A)). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999. The following is a list of the EFH species and applicable lifestage(s) for the area that includes Massachusetts Bay, to which the Charles River discharges:

Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod (*Gadus morhua*)	X	X	X	X
Haddock (*Melanogrammus aeglefinus*)	X	X		
Pollock (*Pollachius virens*)	X	X	X	X

Whiting (*Merluccius bilinearis*)	X	X	X	X
Red hake (*Urophycis chuss*)	X	X	X	X
White hake (*Urophycis tenuis*)	X	X	X	X
winter flounder (*Pseudopleuronectes americanus*)	X	X	X	X
yellowtail flounder (*Pleuronectes ferruginea*)	X	X	X	X
windowpane flounder (*Scopthalmus aquosus*)	X	X	X	X
American plaice (*Hippoglossoides platessoides*)	X	X	X	X
Ocean pout (*Macrozoarces americanus*)	X	X	X	X
Atlantic halibut (*Hippoglossus hippoglossus*)	X	X	X	X
Atlantic sea scallop (*Placopecten magellanicus*)	X	X	X	X
Atlantic sea herring (*Clupea harengus*)		X	X	X
Long finned squid (*Loligo pealei*)	n/a	n/a	X	X
short finned squid (*Illex illecebrosus*)	n/a	n/a	X	X
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Atlantic mackerel (*Scomber scombrus*)	X	X	X	X
Summer flounder (*Paralicthys dentatus*)				X
Scup (*Stenotomus chrysops*)	n/a	n/a	X	X
black sea bass (*Centropristus striata*)	n/a		X	X
surf clam (*Spisula solidissima*)	n/a	n/a	X	X
Bluefin tuna (*Thunnus thynnus*)			X	X

A review of the 23 species revealed that the life stages of concern are present in the seawater salinity zone (salinity > 25.0 parts per thousand) or the mixing water/brackish salinity zone (0.5 < salinity < 25.0 parts per thousand) only. No life stage is identified as inhabiting the tidal freshwater salinity zone. The freshwater of the Charles River does not experience appreciable mixing with the saline Boston Harbor water, due to the location of New Charles River Dam and Locks at the mouth of the river. This dam highly regulates the river level and flow of the Charles River, resulting in the river possessing the characteristics of the freshwater salinity zone. Although there is seasonal salt water intrusion, this typically results in a temporary salt wedge which is usually confined to the bottom few meters of the lower basin of the Charles River.

In addition, during four years of adult and juvenile fish sampling as well as extensive ichthyoplankton collection in the Charles River (1999, 2000, 2002 and 2003; Mirant Kendall Reports), none of the 23 species listed above has been collected.

Based on the freshwater characteristics of the river and the absence of any of the species listed above, EPA has determined that the conditions of this Permit Modification will not have a direct adverse effect on the EFH species of concern.

However, EPA recognizes that Station operation has the potential to indirectly cause adverse effects to EFH species in Boston Harbor or Massachusetts Bay. The Station is located on the Cambridge side of the Charles River, approximately one mile upstream of the New Charles River Dam and Locks. Anadromous species that enter the Charles River and move past the Station to spawn upstream may be affected by the thermal plume or the cooling water intake operation at the Station, or both. These species (blueback herring and alewife), while not identified as EFH species, may be selected as prey by EFH species. If these prey species are affected by Station operation, this has the potential to indirectly affect EFH species through loss of prey. EPA's Final Permit proposes thermal discharge limits under CWA § 316(a) designed to assure the protection and propagation of the balanced indigenous population of fish, shellfish and wildlife in the lower Charles River basin, including the anadromous fish species discussed above.

Moreover, it has been determined that the operations with the new equipment represents the Best Technology Available for minimizing adverse environmental impact, since the intake of water is substantially reduced. This BTA is expected to reduce losses of blueback herring and other anadromous fish species in the lower Basin, and thereby also reduce losses of these forage sources for certain EFH species that are present in Boston Harbor.

EPA believes that the conditions and limitations contained within the draft permit adequately protects all aquatic life, including those forage sources for EFH species in the receiving water, and that further mitigation is not warranted. Should adverse impacts to EFH be detected as a result of this permit action, or if new information is received that changes the basis for EPA's conclusions, NMFS will be contacted and an EFH consultation will be re-initiated.

As the federal agency charged with authorizing the discharge from this facility, EPA has submitted the draft Permit Modification and Statement of Basis, along with a cover letter to NMFS Habitat Division for their review.

IV. **Endangered Species Act (ESA)**

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA), grants authority to, and imposes requirements, upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and habitat of such species that has been designated as critical (a "critical habitat"). The ESA requires every Federal agency,

in consultation with, and with the assistance of, the Secretary of Interior, to ensure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and Wildlife Service (USFWS) typically administer Section 7 consultations for bird, terrestrial, and freshwater aquatic species. NOAA Fisheries typically administers Section 7 consultations for marine species and anadromous fish.

EPA has reviewed the federal endangered or threatened species of fish, wildlife, and plants to see if any such listed species might potentially be impacted by this Permit Modification and has not found any such listed species. Upon review of the current listing of endangered and threatened species in Massachusetts, there appear to be no species of concern present in the vicinity of the discharge. Therefore, EPA has determined that this permit action will have no effect on any listed species and that it does not need to consult with NMFS or USFWS under the ESA regarding the effects of this draft Permit Modification. EPA has, however, provided a copy of this draft Permit Modification to both NMFS and USFWS for comment as part of the public comment period.

V. State Certification Requirements

Under Section 401 of the CWA, EPA is required to obtain from the state in which the discharge is located a certification that all water quality standards or other applicable requirements of state law, in accordance with Section 301(b)(1)(C) of the CWA, are satisfied. EPA permits are to include any conditions required in the state's certification as being necessary to ensure compliance with state water quality standards or other applicable requirements of state law. *See* CWA Sections 401(a) and (d), and 40 CFR § 124.53(e). Regulations governing state certification are set out at 40 CFR §§ 124.53 and 124.55. EPA regulations pertaining to permit limits based upon water quality standards and state requirements are contained in 40 CFR § 122.44(d).

The staff of MassDEP has reviewed the draft permit modification and advised EPA that the limitations are adequate to satisfy the Massachusetts water quality standards. *See* generally 314 CMR 4.05(3)(b). EPA has requested permit certification by the State pursuant to 40 CFR 124.53 and expects that the draft permit modification will be certified.

VI. Public Comment Period, Public Hearing, and Procedures for Final Decision

All persons, including applicants, who believe any condition of the Draft Permit modification is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to George Papadopoulos, U.S. EPA, Industrial Permits Branch, Mailcode OEP 06-1, 5 Post Office Square, Suite 100, Boston, Massachusetts 02109-3912. Any person, prior to such date, may submit a request in writing for a public hearing to consider the Draft Permit modification to EPA and the State Agency. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public meeting may be held if

the criteria stated in 40 C.F.R. § 124.12 are satisfied. In reaching a final decision on the Draft Permit modification, the EPA will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period, and after any public hearings, if such hearings are held, the EPA will issue a Final Permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. Within 30 days following the notice of the Final Permit decision, any interested person may submit a petition for review of the permit to EPA's Environmental Appeals Board consistent with 40 C.F.R. § 124.19.

VII. EPA and MassDEP Contacts

Additional information concerning the draft Permit Modification may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays, from the EPA and MassDEP contacts below:

George Papadopoulos, Industrial Permits Branch
5 Post Office Square - Suite 100 - Mailcode OEP 06-1
Boston, MA 02109-3912
Telephone: (617) 918-1579 FAX: (617) 918-1505
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Kathleen Keohane, Massachusetts Department of Environmental Protection
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October 18, 2010
Date

Stephen S. Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

References

(D. Bailey, 2007) Bailey, D. and G. Allen. 2007. Assessment of Alternative Fish Protection Technologies and Operational Measures for Potential Use at Mirant Kendall LLC. September 19, 2007.

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(MKS, 2007) Personal communication from Shawn Konary of MKS during site visit of June 25, 2007 and phone conversation of November 20, 2007.

(Raffenburg et al., 2001) Raffenburg, M.J., J.A. Matousek, W.D. Saksen, A.J. McCusker, E.W. Radle. Development of Filter Fabric Barrier to Reduce Impacts to Aquatic Populations at Water Intake Structures.

TABLE 1

Treatment Chemicals Used at Mirant Kendall Cogeneration Station					
Chemical Name	**Use**	**Hazardous Constituents and Chemicals of Concern**	**Where Used**	**Approximate amount used per year in gallons**	**Concentration in Process Equipment**
Sodium Bisulfite 38-40%	Dechlorination agent	Sodium Bisulfite	In UF Permeate line prior to RO	5,500	10 to 50 ppm
Avista Vitec 3000	Reduces scale precipitates and particulate fouling in RO system	None	RO System	660	5 ppm constantly in influent to RO System
BL-1794 (Phosphate)	Reduce Boiler iron oxide build up	None	Boiler Units	2,200	
BL-1240 (Oxygen Scavenger)	Oxygen Scavenger	Erythorbic Acid	Boiler Units	1,870	
BL-1554 (Amine)	Condensate system corrosion control	Methoxypropylamine and Diethylaminoethanol	Boiler Units	1,150	
BL-129	Oxygen Scavenger	Sodium Sulfite	Boiler Units	< 300	
BL-4350 (Phosphate)	Reduce Boiler iron oxide build up	None	Boiler Units	<300	
Anhydrous Citric Acid	Cleaning Agent	None	UF Filter		
Sulfuric Acid	Neutralization Agent	Corrosive	Prior to Mixed Bed Waste Tank	Variable	96% feed rate a function of the Ph
Sodium Hydroxide	Neutralization Agent and Cleaning Agent to Reduce Fouling	Corrosive	Prior to Mixed Bed Waste Tank and in UF during Backwash	Variable	50% Sodium Hydroxide feed rate a function of Ph
Sodium Hypochlorite	Biocide	Free Chlorine	Influent to water treatment prior to UF and in Plant intake water	Variable. Depends on the Chlorine demand capacity of the river water	20% solution. UF influent at 1-2 ppm and 35-50 ppm in Backflush. Also fed through each intake at a rate of 0.1 ppm free product to control biofouling