EXHIBIT 1 HISTORICAL AND TECHNICAL BACKGROUND

The final NPDES permit in EPA Attachment B lists six existing Cambridge CSOs that discharge into Alewife Brook. During dry weather, Cambridge sanitary and combined sewers flow into these CSO structures and are directed through connecting pipes into the regional sewer interceptors operated by the Massachusetts Water Resources Authority ("MWRA" or formerly the Metropolitan District Commission). The close relationship of local sewer and regional sewer systems MWRA and Cambridge) has required the two entities (the "agencies") to work cooperatively on water quality, combined sewer overflows and drainage.

It is my understanding that during storm events, either the connecting pipes or the twin interceptors or both can become overloaded from the added storm runoff and inflow, necessitating a flow relief within the CSO structure. The most common method to achieve such relief is to have a conduit overflow structure connecting to Alewife Brook, with a weir that allows any sewer effluent from Cambridge above the top elevation of the weir to "overflow" into the brook. The unacceptable alternative is backing up of sewage into residential and commercial areas of Cambridge.

More frequent overflows can occur in intense storms which create large sudden volumes of runoff which overload the MWRA system without necessarily resulting in flooding conditions in Alewife Brook. Such overflows can occur in almost any warm weather period of the year in the Northeast and are not the concern of this appeal. My concern is the less frequent but more severe events that occur during floods of one-year to 100-year flood frequency, when runoff is large and prolonged, producing health problems from high sewage content of storm waters, especially when those flood waters approach residential areas in the flood plain. Such conditions are characterized by the existence of both sewer overflows and high rates of inflow into sewer systems.

Due to severe water quality problems with rivers and streams, and ultimately Boston Harbor, the EPA and the Conservation Law Foundation became involved in civil litigation against the then-metropolitan District Commission in the 1980s, with agreements as cited in Attachment E of the Final Permit. Through Court order, the MWRA prepared a Long-Term Combined Sewer Overflow Control Plan to provide sewer separation, closure of CSOs and other actions to improve water quality in tributaries to Boston Harbor. At Alewife this action took the ultimate form of a plan to separate two CSO areas in Cambridge and related outfalls CAM-004 and CAM-400

while introducing a connected plan to provide drainage and flood relief for certain areas of Cambridge. These drainage plans took the form of introducing a new parallel drainage relief conduit, called Contract 12, with the effect of doubling the conveyance capacity and discharge of storm runoff into Alewife Brook.

In the April 2001 Notice of Project Change and in subsequent submissions on 2003 for a state DEP variance, MWRA and Cambridge characterized the impacts of CSO separation and drainage changes as if they were a unified project. As stated in the NPC Executive Summary, p. E-1, there were two reasons for the making the project change : one was CSO control and the other was "related stormwater management" and ways of "managing the resulting increased volume of separate stormwater." This second priority originally had no relevance to water quality concerns. The NPC explained that "it became clear that the City of Cambridge needed to improve drainage service to the residential areas where sewer separation was proposed, to provide an appropriate level of drainage control beyond the existing 1-2 year storm frequency level. These changed conditions led to significant (six fold) project cost increases." (p. E-2)

From the beginning, the two agencies recognized that these drainage changes would increase flooding but did not explain how such increased flooding would contribute to higher inflow into the sewer system through the remaining CSO structures along Alewife Brook.

Primarily for reasons of flood mitigation, the agencies in 2001 proposed a "low earthen berm" to offer "mitigation for both existing flooding and from the potential marginal increase in water surface elevation resulting from the project. The berm also provides a public health benefit by preventing floodwater containing CSO from reaching properties currently impacted during flooding up to the 25-year storm event." (pp. E-5 to E-6). This berm was ultimately deleted from the plan and no mitigation substituted for it, thus removing any of the associated flood and water quality benefits claimed for the berm.

The joining of the sewer separation and drainage projects has resulted in any detrimental aspects of the drainage project being carried forward in the shadow of the water quality advantages of sewer separation. The NPDES permit for Cambridge should have clearly distinguished the two projects, and explicitly presumed that only the CSO projects would move forward.

The water quality implications from policies of the City of Cambridge are significant and are at variance with those of MWRA. For example, MWRA has indicated its preference for more flap gates on remaining CSOs. Currently, two CSOs have flap gates. Cambridge has opposed the expansion of such a policy. It is an obvious fact that the worst water quality problems arise from CSO and SSO events and that both occur during and after storm events and are related to high volumes of inflow into sewer systems. The linkage of storms and sewer overflows and inflow is logical and unavoidable. The worse the storm, the worse the overflow and the worse the inflow.

At Alewife, not all sewer overflows occur during floods, but all the floods coincide with sewer overflows. Flooding and sewer overflows are linked, and to make flooding worse makes overflows worse. Inflow is a common element in all overflow incidents and above a certain threshold of flood elevation, all flooding contributes to inflow problems where CSO structures are present and unprotected by flap gates.

The evidence from the various MWRA and Cambridge documents is that attempts to reduce flooding in Cambridge neighborhoods will result in greater flooding in Alewife Brook and thus worse water quality conditions in the brook and surrounding flooded areas. As I noted specifically in my August 22, 2009 comments, studies performed by the City of Cambridge show clearly the worsened flood conditions in Alewife Brook. My letter provided source documentation, as does Exhibit 5 of this appeal. MWRA and Cambridge in the 2001 NPC admitted that flooding conditions would be worse and sought unsuccessfully to proposed mitigation for these flooding and water quality impacts by a proposed earthen flood berm -- a concept since abandoned without further mitigation.

These conclusions regarding flooding are unaffected by recent FEMA studies of flood elevations at Cambridge, since these new studies are unofficial and will not be approved by any communities until Spring 2010. The FEMA studies did not include the effects of the Cambridge drainage relief work in is modeling, and generally do not tell us what are the consequences of added floodwater from drainage or development projects.

The second Cambridge policy with a detrimental effect on water quality is its disinclination to support the installation of flap gates on CSO outlet pipes. I expressed this concern directly in my August 22 comments. The Permit in section D.5. identifies the concern and proposed a study be included in the April 30, 2011 annual report. I am fully supportive of such a study, but I believe that the likely producer of such a

study -- the City of Cambridge -- should not be a direct participant in worsening flooding and inflow along Alewife Brook. I believe that the permit should include a condition and prohibition to that effect.

The second party in the CSO/drainage project -- the MWRA -- has taken a positive stance in support of flap gates, However, by mutual agreement MWRA has agree to pay for half of Cambridge's drainage project. I would note that there is some doubt over the legality of MWRA involvement in drainage projects, but these matters are issues of state and local concern, not a specific issue to be addressed in an NPDES permit.

The brook inflow problem is a combination of existing inflow from Alewife Brook during floods and of future increases from the Cambridge drainage project. The water quality implications of such inflow is that downstream sections of the MWRA interceptor becomes loaded beyond capacity, and in similar fashion to CSOs, an overflow relief channel must be provided. The most common and evident relief point is at the Alewife Brook Pump station near Dilboy Field in Somerville, about one to two miles downstream of the Cambridge CSOs. Under conditions of downstream flow limits, this pump station diverts the excess flow to an external chamber on the north side of the building. Under the action of pumping, the sewage spills over onto the surrounding ground surface and flows overland until it reaches the earthen bank of Alewife Brook. During ten year floods with such overflows, much solid matter is left on the surface, and workers in protective suits are dispatched by MWRA to clean up the site (see Exhibits 2 and 3 attached).

Because of the absence of flap gates in the plan for Alewife Brook and the increased flooding from Cambridge's drainage project, I do not believe that the wet weather effluent limitations of item (4) of A.1.(a) can be fully implemented as one of the Nine Minimum Controls under the Final Permit as written. In this case, the increase in inflow into the MWRA interceptor sewer cannot be considered a "maximization of flow" of effluent to the Deer Island treatment plant. There is much sewage overflowing at the Alewife Brook pump station, because there is too much inflow water through the Cambridge CSOs.

A contributing factor to the problem may be that bureaucracies tend to create separate compartments of information, with water quality in one and flooding in another. The fact that flooding and water quality are fundamentally linked is shown in page 2 of the permit, where Effluent Conditions begins with "During wet weather ..." and all nine of the Minimum Controls (except for number 5) relate to wet

weather conditions. There should be no hesitation on the part of EPA to include within its permit the issue of flooding as an element in its concerns for water quality during wet weather and as a contributing factor to high volumes of inflow into sewer systems during storm periods.

EPA in its permitting need not specify the manner in which inflow can be reduced. Neither must it address the technical details of flooding, inflow, flap gate operation and downstream SSO overflows. The agency and the Board should recognize that system inflow is a valid concern for the operation of wastewater systems, and that an assessment of inflow impacts is a valid concern of this permit. The need for an inflow study and report has already been taken by the Final Permit. The agency should include within its permit specifications any elements of priority information that would be useful in understanding the defining the extent of inflow from stream flooding sources. Most importantly, the permit should preclude any action by the permitee that could worsen inflow conditions and do so without committed mitigation actions by said permitee.

The request contained in the petition for relief is a simple and valid request based on evidence provided by the permitee. This evidence is summarized in reports prepared by the permitee. Such evidence is reprinted in Exhibit 5 and shows that flooding would be made more severe by the connected but functionally separate drainage project, that this flooding evidence is contained in both the 2001 NPC and 2003 Final Variance Report, and that EPA has heretofore not recognized the existence of such evidence and its implications for sewer system inflow.

Based on this technical understanding of the existing sewer and drainage conditions along Alewife Brook, I have prepared the related claims and requests for relief included within this petition.

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