



Background

Since the late 1600's, residents of Boston have been disposing their wastewater in the waters of Boston Harbor. The first rudimentary sewers were constructed by energetic residents who could persuade his neighbors to join in the building of a street drain running along the shortest line to the shores of the harbor. The City of Boston would take control of the sewers in 1823 and continued construction of sewers for the expanding city. By 1873, Boston had about 125 miles of sewers (Dolin, 1990.)

The middle of the 19th century saw increased concern over the link between human health and sanitation and inadequate handling of the city's sewage was seen as the major problem. At the urging of the city Board of Health, the Commonwealth of Massachusetts enabled Boston and then a new public agency, the Metropolitan Sewage Commission (MSC), to construct three main sewage drainage systems, the third of which would be completed in 1904. Each sewer system transported wastewater "away" from residents and out to Moon, Deer or Nut Islands where it was collected in reservoirs while awaiting release into the harbor, untreated, with the outgoing tide (Dolin , 1990.)

The three conveyance systems did little to "solve" the Boston area's sewage problems. The sanitary conditions around the harbor continued to deteriorate as the amounts of untreated sewage released into the harbor grew. By 1939, a state commission that studied the situation determined that over 250,000,000 gallons of raw sewage was discharged into the harbor each day and urged immediate corrective action. The response from the state was to construct two new primary treatment plants. Primary treatment, generally defined as the level of treatment that removes nearly all settleable solids, reduces suspended solids by 60 percent and biological oxygen demand (BOD) by 30 percent, was at state-of-the-art at the time but it would take years before the state and the Metropolitan District Commission (MDC), the agency that replaced MSC in 1919, would actually complete the first plant. The Nut Island plant was brought on line in 1952 while the second plant, the Deer Island plant would not be completed until 1968.

In the meantime, the federal government was beginning to establish its role in regulating water pollution. The first federal legislation aimed at water pollution was the Federal Water Pollution Control Act of 1948 which provided technical assistance funds. Repeated amendments to the law over several decades increased the federal role in regulation. With the Water Quality Act of 1965, the focus of the legislation became the establishment of water quality standards. But it was difficult to link the standards directly to any specific discharger and, therefore, difficult to assess responsibility. Then, as public concern with the environment mounted and general frustration about the lack of progress towards clean water goals persisted, the federal government enacted the Clean Water Act of 1972 (CWA), a dramatic and ambitious step towards cleaner water. The CWA shifted the focus of clean water on controlling the discharges into receiving waters through effluent limitations and use of best available technologies. Culpability for water pollution was now placed squarely upon polluters.

Specific requirements of the CWA required municipal pollution dischargers, such as MDC's Nut and Deer Island primary treatment plants, to employ secondary treatment technologies by July 1, 1977. Secondary treatment is broadly defined as removal of 85 percent of both suspended solids and BOD and is usually achieved through the use of sewage-digesting bacteria. This would entail a very large and expensive upgrade to the existing MDC plants. MDC at first began the process of studying and planning the upgrades but quickly abandoned those plans when the 1977 CWA amendments allowed the possibility of a waiver from secondary treatment responsibility for municipal dischargers. MDC, at the insistence of the state legislature and governor that believed the benefits of secondary treatment were not worth the investment, directed all their planning efforts at obtaining a waiver.

Yet even with the increased public awareness and federal regulatory changes, MDC was entirely failing to manage the wastewater system. The primary treatment plants were under-designed to handle the ever increasing capacity needs of the growing Boston area and often simply were in a state of disrepair. MDC's inability to garner adequate funding from the state legislature and a technically incompetent workforce resulted in their inability to provide even effective primary treatment. The consequence was the continual discharge of untreated sewage into the harbor. Harbor beaches were often fouled with pollution. Shellfish harvesting was prohibited throughout much of the region. Finally, in 1982, even as MDC and the state continued pursuing their waiver from the U.S. Environmental Protection Agency (EPA), a lawsuit was filed by William Golden, City Solicitor for the Town of Quincy, against the MDC for violation of the CWA. After a fact finding exercise that determined the MDC wastewater system as the main source of harbor pollution, Judge Paul Garrity issues a Procedural Order to force the state to replace the incapable MDC with an independent authority to carry on the task of compliance with CWA. Faced with a court-imposed sewer moratorium and the threat of receivership for the wastewater system, the state finally created the Massachusetts Water Resources Authority (MWRA) in December 1984.

MWRA's first task, however, was to defend another lawsuit brought by the Conservation Law Foundation in federal court. In September 1985, six months after EPA ended a six year long waiver application process by issuing MWRA (as MDC's successor) a denial, U.S. District Court Judge A. David Mazzone found MWRA liable for violation of the CWA. Before the end of the year, Judge Mazzone would issue a court order that mandated a lengthy and costly wastewater infrastructure construction program designed to ensure MWRA's compliance with the CWA by 1999.

The Outfall Tunnel

The court order featured several milestones for the completion of construction and improvements to the various components of the wastewater system. The concept was simple: build new primary and secondary treatment facilities, end the discharge of sludge to the harbor and address the problem of the combined sewer overflows (CSO, combination sanitary and storm sewers that drain directly to the harbor or other tidal estuary.) Specifically, MWRA was ordered to construct a new primary and secondary treatment facility at Deer Island with a peak flow capacity of 1.3 billion gallons per day, construct a sludge processing plant to manufacture fertilizer pellets from the residual sludge and bore an outfall tunnel to carry the effluent from the new plant 9.5 miles out into Massachusetts Bay.

Construction work started on the project in 1988 at the Deer Island plant. Construction of the tunnel, however, was the most challenging part of the overall project. The outfall begins as a dropshaft on Deer Island bottoming out 380 feet below sea level. From that point, a 27-foot-

diameter, 720-ton tunnel boring machine drilled 9.5 miles northeast through the bedrock underneath Massachusetts Bay. A total of 55 risers connect to the outfall tunnel in the last 1¼ mile of the tunnel. Each 30-inch diameter riser pipe links to a predrilled hole in the tunnel wall 250 feet below the seafloor and connects to a mushroom shaped diffuser cap on the sea floor. The diffuser section is the point at which wastewater leaves the infrastructure system and returns to the natural environment.

Siting the Outfall Tunnel

Typically, siting decisions for infrastructure facilities can be as complicated and demanding as the construction itself. The usual decision-making process for site selection is the environmental review process, mandated by the National Environmental Policy Act of 1969 for federal actions and mirrored in state legislation for many state actions. The process, which revolves around the creation and approval of an environmental impact statement (EIS), has also been developed to facilitate public involvement in the decision-making process. In some cases, however, as evidenced by the Boston Harbor outfall tunnel, public involvement through the EIS process is not sufficient.

After EPA twice rejected the secondary treatment waiver requested by MWRA (initiated by MDC,) the recourse was to file for a National Pollution Discharge Elimination System (NPDES) permit for the discharge of secondary treated effluent into Massachusetts Bay. The NPDES permit, required by the CWA as a means of controlling discharges into bodies of water, is issued jointly by the US EPA and the Massachusetts Department of Environmental Protection (MADEP) and initiated an EIS process. The focus of the review was to determine the appropriate site for the tunnel outlet to ensure full compliance with the water quality standards stipulated in the CWA.

Though MDC's waiver applications were denied, much of the siting work done for those applications was carried over to the NPDES permit application with the main difference being that the effluent discharged would be "cleaner." Plans for a deep rock outfall tunnel were initially proposed in the first MDC waiver application. Criteria for siting dictated a location that 1) provided 50 to 1 seawater to effluent initial dilution, 2) was far enough from shore so that particles from the effluent would not return to shore on the next incoming tide, and 3) avoided sensitive and unique resources. This favors the deeper waters of Massachusetts Bay over the 30 foot deep Boston Harbor. Seven outlet locations were evaluated, generally to the north and east and up to 10 miles from Deer Island. Beyond 10 miles, the cost effectiveness of the tunnel would decline. EPA approved a location in November 1988 and construction of the tunnel started in summer 1990.

Controversy

In March of 1991, MWRA announced a plan to scale back the secondary treatment capacity of the new plant by one half. Citing the potential \$2 billion cost savings, the move was championed by MWRA as prudent response to the skyrocketing water and sewer rates that had given rise to ratepayer revolt. The proposed plan would halt construction of the plant after completing the first half of the secondary treatment portion and then monitor the water quality of the harbor for some time before proceeding. In the meantime, MWRA would discharge effluent that had only received primary treatment. The proposal, it turned out, gave rise to a storm of protest.

While the local residents had complained that the outfall was too short, a new constituency from Cape Cod began to protest that the outfall was too long. Though more than 30 miles from the outfall discharge, many Cape residents feared that the effluent would have detrimental effects on the Cape's marine environment and thus their natural-resource based economy of fishing, tourism and

retirement communities. MWRA's proposal jolted the community into action as they learned that sewage with only primary treatment would be discharged into Massachusetts Bay. In response to the growing concern, a grass roots group Stop The Outfall Pipe, or STOP, was launched in the summer of 1991. STOP was entirely opposed to the outfall tunnel and argued that Boston's sewage should remain in Boston - shorten the tunnel to one half mile and use the money saved to provide better treatment plants.

Of particular concern to STOP was the potential for nitrogen loading in Massachusetts Bay. As a nutrient, too much nitrogen can cause abnormally large algae and phytoplankton blooms lowering dissolved oxygen (DO) in the water and in the bottom sediments as the dying organisms decay. This process of eutrophication can have damaging impacts upon marine life and thus serious impacts on the fishing industry. Especially worrisome to STOP were the potential impacts, from nutrient loading and long-term toxic bioaccumulation, upon the northern right whale, the world's most endangered whale, which spends many months each year feeding and breeding in the waters of Cape Cod and Stellwagen Bank. Stellwagen Bank itself, just north of Cape Cod and about 16 miles from the outfall discharge, was at the time also likely to be designated as a National Marine Sanctuary. Though EPA and MWRA conducted studies that indicated there would be no impact, a tide of skepticism swept the Cape and STOP maintained that MWRA really didn't know for sure what would happen.

Public Participation

A chief complaint of STOP was that during the permit phase, no public meetings had been held south of Quincy. Provincetown is more than a 1 ½ hour drive from Boston and 32 miles from the outfall discharge site, the Cape community was left out of the public review process simply by dissociation from the project. (The rules called for ??? participation by who???) Without a voice in the formal public review process, STOP's alternative was to pursue methods outside of the process.

STOP found a way into the process through the political arena. One of their first actions was to compile more than 30,000 signatures for a petition delivered to Massachusetts Governor William Weld asking for his support in opposing the project. Without going so far as to oppose the project, Gov. Weld pledged "solidarity" with the group's cause and declared his support of the principles of the CWA. STOP also found a good deal of support in their congressman, Gerry E. Studds who was against the tunnel outright. Studds was instrumental in focusing a great deal of attention on STOP's agenda at both the federal and state level and proved to be their biggest ally.

As Chairman of the House Subcommittee on Fisheries and the Environment, Studds was able to escalate another issue. The concern of the northern whale and the proximity of the outfall discharge to their habitat evoked the Endangered Species Act, over which Studds' subcommittee has jurisdiction. According to the Act, federal actions must undergo review to determine their impact upon endangered species. Despite protests from the EPA, Studds was able to pressure EPA into conducting studies formally required by the Endangered Species Act. The study, initiated in April 1992, would be reviewed by the National Marine Fisheries Service (NMFS) which had the final say. Potentially, the findings of NMFS could have devastated the project. If it was determined that the outfall would have negative impacts upon the whales, it could be halted and was sure to wind up in a lengthy federal court battle setting the Clean Water Act against the Endangered Species Act.

STOP helped focus public attention on the tunnel and stirred a political controversy. Other grass roots groups sprung up around the region attacking the project over different issues. As STOP and

Congressman Studds pressured Governor Weld, EPA and other state environmental officials to address their concerns, MWRA ratepayers in the Boston area were simultaneously pressuring their elected officials to reduce their escalating water and sewer bills. Even after the public participation process of the environmental review had ended for most parts of the new system, the public was becoming more vocal about their unease with the direction of the project.

A Shift

In spite of STOP's claims to the contrary, MWRA maintained that the outfall would not have any significant impacts in Cape Cod. The improvements to the harbor, it was claimed, would not come at the expense of the Cape. EPA's environmental review and subsequent approval of the site was based on studies that essentially determined that the effluent discharge would be extremely diluted even if it made its way to Cape Cod.

Then in May 1992, the MWRA changed their response to the controversy. Despite EPA's protests, Douglas MacDonald, the new Executive Director, announced at a news conference that MWRA was initiating new studies on the outfall's impact. "No, we can't say science stopped in 1988," MacDonald said. "There is a clear need for more and better information... We must acknowledge the scientific environment has not been static." MacDonald emphasized though that this did not mean that MWRA's past decisions were flawed, but that only there is a need for continuing research. He, and later EPA, remained confident that the new studies would support past findings.

In his first two months on the job, MacDonald paid many visits to Cape Cod to listen and learn why the community was so adamant about stopping the outfall. He also had discussions with Studds who urged him to review the scientific evidence. Somewhat bowing to the protests, MacDonald quickly retreated from MWRA's former position.

Through protest and political pressure, STOP and other environmental advocates were successful in reopening the case and taking a second look at the outfall. But by summer 1993, most of the additional studies were complete and offered no evidence that the outfall would impact marine life. The final blow to the outfall opponents came that July as Judge Mazzone, citing that "two federal reviews in five years found no evidence that effluent" "would harm whales," rejected the final two law suits against MWRA and the outfall.

Outcome

The tunnel is completed and permitted yet not functioning due to a construction accident that left two workers dead while completing the last construction task. In fact, the construction delays and problems that occurred over the course of the tunnels construction added more time and cost to the project than. MWRA's proposal to discharge primary effluent for a few years, the proposal that ignited the controversy, in fact, made no difference. Construction delays pushed tunnel completion well beyond the initial 1995 expected completion date and beyond the 1997 completion of the first section of secondary treatment facilities – happenstance welcomed by outfall opponents and condemned by the cost-absorbing MWRA ratepayers. A modified version of MWRA's proposal was approved by Judge Mazzone in the fall of 1995 allowing MWRA to scale back secondary capacity by 25% saving an estimated \$165 million – a bonus to the ratepayers.

After passing all technical, regulatory and legal challenges, the outfall tunnel and its discharge site exist where originally planned. The wastewater system, however, may not function as was initially intended by MWRA. The NPDES permit jointly issued by MADEP and EPA is one of if not the

most stringent permits ever. After the first draft was released in 1998, Extensive water quality monitoring requirements and contingency plans are included, in line with what STOP and Congressman Studds has demanded. MWRA is required to monitor dozens of environmental parameters. When any parameter threshold is reached, the permit automatically requires MWRA to initiate corrective actions and report all events and actions to EPA and the public. The final permit is the result of more than a year of cooperation between MWRA, EPA, and MADEP. Like the outfall tunnel siting, the NPDES permit has an extensive public review process. This time, however, public meetings were held in Boston, on the North Shore, and in Barnstable, at the foot of Cape Cod.

APPENDIX A Stakeholders and Decisionmakers

Proponents of Outfall Pipe and Siting

Judge A. David Mazzone was the Federal judge who issued the court order in 1985 (Conservation Law Fund lawsuit) requiring the MWRA to construct and upgrade wastewater facilities for the Metropolitan Boston area to be in full compliance with the Clean Water Act by 1999. He interacts with MWRA, EPA and Public Interest Groups filing suit (Bays Legal Fund). He represents the law, and is the ultimate decisionmaker.

The *Massachusetts Water Resources Authority* (MWRA) is the owner and operator of the metropolitan Boston water and sewer system and is executing the Federally-mandated construction and improvement program to meet CWA enforced by USEPA and MADEP. MWRA interacted with Judge Mazzone, EPA, federal and state politicians and dozens of community groups.

Executive Director Paul Levy (1987 – 1992.) While moving forward with construction of outfall based on the 1988 EPA approval, MWRA begins exploring cost savings modifications to the facilities including cutting secondary treatment in half. This proposal meant the outfall would discharge primary effluent for a few years before the secondary treatment facilities came online.

Executive Director Douglas MacDonald (1992-pres.) Upon his arrival, MacDonald declared that the outfall decision was based on 1988 science and immediately initiated three new independent studies to determine the impacts of the effluent on the marine environment. He interacts with Federal and state enforcement agencies, Federal and local courts, ratepayers, host (and possible-host) communities (e.g., Walpole, Cape Cod), environmentalists (e.g. STOP, Greenworld), politicians representing host communities (Rep. Studds), politicians representing ratepayers (Gov. Weld); He is a key decisionmaker on facility planning, siting and construction, funding issues (rate setting) and sources, and outfall impacts.

The *United States Environmental Protection Agency* has federal authority for enforcing Clean Water Act including the issuance of NPDES permits. It conducts and reviews Environmental Impact Statements required under NEPA, and works with Massachusetts DEP in controlling water pollution in the nation's waters. In the siting of the outfall, EPA was also required to perform a biological assessment, in accord with the National Endangered Species Act, in consultation with the National Marine Fisheries Service. The U.S. EPA made the following decisions with respect to the outfall issue:

- Denied MWRA/MDC 301(h) (secondary treatment) waiver application in 1985 which included Massachusetts Bay outfall.
- Approved outfall in conjunction with court-ordered upgrades to secondary treatment in November 1988.
- Issued NPDES permit in May 1999 imposing strict monitoring and contingency plans upon MWRA in response to concerns.

The *Massachusetts Department of Environmental Protection (MADEP)* is the State counterpart of the US EPA. It jointly issues the NPDES permit with EPA. Its role is very similar to USEPA except MADEP represents local (state) public.

The *National Marine Fisheries Service* has responsibility under the Endangered Species Act to review, in consultation with the EPA, the potential impact of the outfall on endangered species like the northern right whale. It issued a Biological Opinion in September 1993 that the outfall was not likely to jeopardize any endangered species. They interact with EPA and Representative Studds who chaired the House committee that has responsibility for the Endangered Species Act. Essentially, they acted as the representative of the marine life at and near outfall site.

Other proponents include the U.S. Army Corps of Engineers (approvals allowed construction to be done in and around the harbor) and the National Oceanic and Atmospheric Administration in the U.S. Department of Commerce (manages Stellwagen Bank, provides oceanographic studies).

Opponents / Challengers of the Outfall Tunnel and Siting

Stop The Outfall Pipe (STOP) was a Cape Cod based grass roots coalition formed in 1991. Their foundation is that the outfall cleans Boston Harbor at the expense of Cape Cod and Massachusetts Bay. It represents or is supported by Cape Cod “planning boards, chambers of commerce, environmental groups and commercial maritime organizations”, residents, tourism industry, etc. (*Boston Globe*, 9/19/91) They were able to garner significant political support in Governor Weld and U.S. Rep. Gerry Studds who applied valuable political pressure at the state and federal levels. STOP sought additional federal funding to pay for tertiary treatment in lieu of bay outfall, funded its own scientific studies of the outfall, and was a party in the Bays Legal Fund lawsuit. They interacted mostly with MWRA and EPA but also with Judge Mazzone in the court since STOP was not a decisionmaker.

Greenworld (Max Richard Strahan) is a radical environmental group claiming to represent the northern right whales. It filed suit against MWRA, EPA, etc. charging that biological studies required by the Endangered Species Act were not done prior to issuance of permits for the outfall. Greenworld is not a decisionmaker and so interacted through the court.

Bay's Legal Fund (Wayne Bergeron) is an organization funded by Cape Cod municipalities and supported by whale watching and fishing industries (*Boston Globe*, 5/07/93) Like Greenworld, they are not a decisionmaker and so chose to interact through the courts. They filed suit against MWRA, EPA, US Army Corps of Engineers charging violations of the Endangered Species Act by approving the outfall tunnel before performing studies required under the Act were initiated.

Center for Coastal Studies (Co-Founder and Whale Researcher Charles (Stormy) Mayo) is a leading whale advocate group, that first raised attention to the possible impacts of the outfall.

U.S. Representative Gerry Studds represents Cape Cod residents and businesses (tourism, fishing) put his support behind outfall opponents and is their political voice in the state and

Washington, DC (as Chairman of House Subcommittee on Fisheries and the Environment, has jurisdiction over Endangered Species Act) (*Boston Globe*, 4/07/92)

He pushed to have NMFS review the outfall case under the Endangered Species Act and persuaded the Bush Administration to designate Stellwagen Bank a National Marine Sanctuary. He also coaxed the MWRA (MacDonald) to develop the outfall contingency plan incorporated into NPDES permit. Rep. Studds was not a direct decisionmaker but was very influential in his interaction with the federal government (NMFS, funding issues, Bush administration), local (Cape Cod) politicians, public and businesses, outfall siting agencies (MWRA, EPA), and state politicians (Weld, state legislature).

Massachusetts Governor William Weld supported anti-outfall groups like STOP in their attempts to get MWRA and EPA to conduct studies but stopped short of supporting the elimination of the outfall altogether. Interacts with Cape Cod public and businesses, state politicians, ratepayers, MWRA, federal government (Bush administration); His role as a decisionmaker was indirect. He was the Chief Executive controlling MADEP decisions on facility siting, planning and construction approvals and operating approvals (MDPES permit).

MWRA Ratepayers are property owners and businesses who opposed to the project in general because high cost causing high rates. It has little group representation. It interacts with local politicians.

APPENDIX B

Case Chronology of the Boston Harbor Effluent Outfall Tunnel

- 1976 Metropolitan District Commission's (MDC) Eastern Massachusetts Metropolitan Area (EMMA) study is completed. Details a plan for wastewater management for the following 80 years. Recommends current rehabilitation of existing facilities, upgrading to secondary treatment by 2000 and installation of facilities to control the combined sewer overflows (CSOs). (Dolin, Eric J. 1990. *Dirty Water/Clean Water: A Chronology of Events Surrounding the Degradation and Cleanup of Boston Harbor*. Cambridge, MA: MIT Sea Grant College Program, p.48)
- 1977 Amendments to the Clean Water Act (CWA) include Section 301(h) that allows publicly owned treatment works (POTW) to apply for a waiver from secondary treatment requirements. (Dolin, 1990, p.53) EPA Administrator can grant approval of waiver if POTW can demonstrate that the current water quality standards are not compromised. (Dolin, 1990, p.58)
- Sept. 1979 MDC submits a 301(h) waiver application to EPA describing plans to upgrade treatment plants at Nut and Deer Islands to meet primary treatment standards, transport Nut Island effluent to Deer Island via an under-harbor tunnel and discharge the combined effluent from both plants into the 100' deep water of Massachusetts Bay through a 7.5 mile outfall tunnel. The permit application does not include the upgrade to secondary treatment. (Dolin, 1990, p.59)
- This is the first plan to include the deep ocean outfall. (Conner, M.S. and Paul Levy. 1992. *The Boston Harbor Cleanup* in *New England Journal of Public Policy*, P. O'Malley, ed. Boston. John W. McCormack Institute of Public Affairs, p.98)
- Dec. 17, 1982 The City of Quincy files suit against MDC for violations of state law regarding wastewater discharges into Quincy Bay. (Dolin, 1990, p.63) William Golden, City Solicitor, waits to file suit until State Judge Paul Garrity rotates through the courts and is assigned to the case. (Weiner, Sanford L. January 1996. "Cleaning Boston Harbor: Politics, Policy, and Expertise," Paper presented at APPAM Meeting, Pittsburgh, PA, p.5)
- June 7, 1983 The Conservation Law Foundation (CLF) files suit against MDC and EPA in federal court for violating the CWA and the latter for failing to enforce the CWA. Judge A. David Mazzone assigned to the case. (Dolin, 1990, p.65)
- June 30, 1983 EPA denies the MDC's 301(h) waiver application. (Dolin, 1990, p.65) Deficiencies cited include, "The proposed discharge is expected to violate the Commonwealth of Massachusetts' water quality standard for dissolved oxygen, but is not expected to violate the Commonwealth's standard for suspended solids...", "The proposed discharge is expected to interfere

with the protection and propagation of a balanced indigenous population of marine life and will not allow for recreational activities...”

- June 4, 1984 MDC submits a second 301(h) waiver application to EPA. Application proposes to extend outfall tunnel 9.2 miles into Massachusetts Bay and to cease sludge discharges into coastal waters.(Dolin, 1990, p.68)
- Dec. 19, 1984 Governor Dukakis signs a bill creating the Massachusetts Water Resources Authority (MWRA). Ownership and control of the MDC system is legally transferred on July 1, 1985. (Dolin, 1990, p.70)
- March 29, 1985 EPA denies second 301(h) waiver application. (Dolin, 1990, p.72)
- Nov. 1985 MWRA prepares Final Environmental Impact Report (in accord with the Massachusetts Environmental Policy Act) providing the basis for MWRA’s decision on where to site the wastewater treatment plant. (Dolin, 1990, p.76) Options include several combinations of primary and secondary plants at either Deer, Nut and/or Long Islands. The 9 mile outfall tunnel is proposed for the primary treatment options. Local harbor outfalls would be used with the secondary treatment options.(Dolin, 1990, p.70-72)
- Dec. 1985 EPA prepares final Environmental Impact Statement (EIS) recommending siting new secondary wastewater treatment plant entirely at Deer Island. (Dolin, 1990, p.77)
- Dec. 23, 1985 Judge Mazzone issues a court-ordered cleanup schedule containing many deadlines. Plan calls for a new secondary treatment facility at Deer Island, the closing of Nut Island plant, construction of a 9.5 mile outfall tunnel and a CSO management plan. (Dolin, 1990, p.78)
- 1986 MWRA creates Facilities Planning Citizens Advisory Committee (FPCAC) including 27 participants from government agencies, environmental groups, community officials, etc. FPCAC developed the criteria for the outfall siting process. (Massachusetts Water Resources Authority. November 1997. *The State of Boston Harbor 1996: Questions and Answers about the New Outfall*. Boston, MA: MWRA)
- Jan. 1986 EPA issues Record of Decision on final EIS that supports siting the new secondary wastewater treatment facility on Deer Island. (Dolin, 1990, p.81)
- Feb. 1987 Water Quality Act of 1987 enacted. The Act replaces the CWA construction grant program with a revolving state loan program and allows dischargers to seek waivers on effluent limitations on ammonia, chlorine, color, iron and total phenols. New system to identify and target toxic “hot spots”(the 304(l) system). (Dolin, 1990, p.82)

- October 1987 Several Massachusetts communities including Hull, Cohasset, Scituate, Marshfield, Hingham and the public interest group, Nahant SWIM, “intervene in the case” of the siting of the outfall. (“Towns, activist group fail in Boston Harbor,” *UP International*, January 6, 1989)
- March 1988 MWRA consulting engineer completes plan for secondary treatment facilities. Plan includes constructing secondary treatment plant at Deer Island with peak flow capacity of 1,080 mgd, converting the existing Nut Island plant into a headworks, connecting the Nut Island headworks to the Deer Island plant through a deep-rock tunnel, and constructing an effluent outfall tunnel to discharge into 7.9 to 9.4 miles out into Massachusetts Bay. (Dolin, 1990, p.89)
- August 3, 1988 Groundbreaking ceremony for the start of construction at Deer Island Treatment Plant. (Dolin, 1990, p.91)
- November 8, 1988 EPA gives final approval of Wastewater Conveyance System including inter-island (Nut to Deer Island) tunnel and the effluent outfall tunnel to discharge to Massachusetts Bay. (Dolin, 1990, p.91)
- January 1989 A Federal court upholds a lower court ruling that the towns of Hull, Scituate and Cohasset and Nahant SWIM intervened in the outfall siting case too late. (“Towns, activist group fail in Boston Harbor,” *UP International*, January 6, 1989)
- July 18, 1990 MWRA awards outfall tunnel construction contract for \$202 million. (Ronald Rosenberg. “MWRA set to award tunnel pact; Sewage outflow will run 9 miles from Deer Island,” *Boston Globe*, July 18, 1990, Metro Sec., p.17+.)
- March 22, 1991 MWRA proposes delaying construction of and possibly eliminating half of the secondary treatment facilities. (James L. Franklin. “MWRA says it wants \$2bcut from harbor bill,” *Boston Globe*, March 22, 1991. Metro Sec., p. 1.)
- This proposal would give rise to the controversy of the siting of the outfall in Massachusetts Bay when it is learned that the effluent would only receive primary treatment for the first few years. (Dolin, Eric J. July/August 1992. “Boston Harbor’s Murky Political Waters,” *Environment*, p.27)
- April 18, 1991 Construction of outfall tunnel begins. (“MWRA breaks ground for Boston Harbor cleanup tunnel,” *U.P.I.*, April 18, 1991, Regional News.)
- July 1991 Stop The Outfall Pipe (STOP) created. (Jeff McLaughlin. “Cape women join up to battle ‘the pipe’,” *Boston Globe*, September 22, 1991. Metro Sec., p.80.)
- September 18, 1991 STOP holds a symbolic “blockade” of Cape Cod Bay. (Jeff McLaughlin and Biddle, Frederic M. “Sewage outfall plan stirs Cape protests,” *Boston Globe*, September 19, 1991. Metro Sec., p.29.)

- December 24, 1991 MWRA ceases dumping sludge in the Harbor. Sludge is barged to FRSA for recycling into fertilizer pellets. (Dianne Dumanoski. "Sludge reaches end of the line," *Boston Globe*, Dec.25, 1991, Metro Sec., p.1.)
- January 1992 STOP study concludes that outfall pipe will lead to excessive nutrients, including nitrogen, in Massachusetts Bay. MWRA scientists find error in conclusion. (Dianne Dumanoski. "Foes of MWRA outfall see more bay pollution," *Boston Globe*, January 6, 1992. Metro Sec., p.15.)
- March 1992 EPA begins consultation with the National Marine Fisheries Service (NMFS), as required under the Endangered Species Act, to examine the impact of the outfall on the North Atlantic right whale. (Jeff McLaughlin. "US studies whether whales endangered by harbor pipe," *Boston Globe*, April 7, 1992. Metro Sec., p.21.)
- May 8, 1992 Indicating that "science [wasn't] stopped in 1988", MWRA Executive Director MacDonald decides to fund additional studies of the potential pollution problems caused by nutrients in the effluent discharge. (Jeff McLaughlin. "MWRA retreats on outflow; Sewage studies inadequate, agency says," *Boston Globe*, May 9, 1992. Metro Sec., p.1.)
- May 27, 1992 In its monthly report to Judge Mazzone, the EPA indicated that they oppose any attempt to reevaluate the plan for the Massachusetts Bay outfall. (Ross Gelbspan. "Outfall pipe needs no2d look, EPA says," *Boston Globe*, May 28,1992. Metro Sec., p.24.)
- October 1992 US Geological Survey produces study indicating "that treated sewage from an outfall tunnel would be diluted so quickly that the contamination would be unnoticeable to marine life within six miles of the discharge" (Scott Allen. "MWRA pipe won't harm marine life, study says," *Boston Globe*, October 22, 1992. Metro Sec., p.1.)
- December 1992 – June 1993 Continued ratepayer revolt leads MWRA to explore cost saving modifications to the court-ordered clean up plan. The battle pits "how clean" vs. "at what cost".
- March 19, 1993 Lawsuit filed by Greenworld against MWRA, EPA, US Army Corps of Engineers, NMFS and MDEP to stop construction of outfall charging inadequate studies required by the Endangered Species Act. (Dianne Dumanoski. "Suit aims to halt tunnel, protect whales in bay," *Boston Globe*, March 20, 1993. Metro Sec., p.35.)
- April 1993 Construction on outfall is one year behind schedule. (Scott Allen. "New troubles for sewage outfall tunnel," *Boston Globe*, April 18, 1993. Metro Sec., p.1.)
- April 22, 1993 Bay's Legal Fund files federal lawsuit charging that the construction of the outfall violates the Endangered Species Act. (Jeff McLaughlin. "Group sues to stop work on sewage outfall tunnel," *Boston Globe*, April 23, 1993, Metro Sec., p.84.)

- April 27, 1993 EPA releases results of year-long biological assessment of outfall impact on marine environment. Report indicates that the outfall will have no significant impacts. NMFS has 90 days to respond. (Jeff McLaughlin. "EPA gives the green light to sewage outfall tunnel," *Boston Globe*, April 28, 1993, Metro Sec., p.23.)
- June 16, 1993 MWRA asks Judge Mazzone to approve costs savings measures including reduction in secondary treatment facilities and CSO facilities. (Scott Lehigh. "MWRA asks harbor-cleanup cutbacks," *Boston Globe*, June 17, 1993, Metro Sec., p.33)
- June 26, 1993 Stellwagen Bank officially dedicated as a National Marine Sanctuary to be managed by the National Oceanic and Atmospheric Administration (NOAA). (Dianne Dumanoski. "Whales helped make case for underseas sanctuary," *Boston Globe*, June 26, 1993, Metro Sec., p.23.)
- July 23, 1993 Judge Mazzone rejects the suits filed by Bay's Legal Fund and Green World indicating that "two federal reviews in five years found no evidence that effluent" "would harm whales". (Scott Allen. "Judge gives go-ahead to sewage pipe," *Boston Globe*, July 27, 1993, Metro Sec., p.1.)
- September 1993 National Marine Fisheries Service completes the final environmental review of the outfall siting. They find that the outfall "may affect" endangered species but is "unlikely to jeopardize" their existence. (Dolores Kong. "Sewage outfall tunnel gets OK," *Boston Globe*, September 16, 1993, Metro Sec., p.30.)
- STOP coalition brings suit in Barnstable Superior Court, saying that a 1970 state law protects ocean sanctuaries from sewage dumping. ("Outfall pipe foes head for court," *Boston Globe*, September 29, 1993, Metro Sec., p.55.)
- June 1994 MWRA Executive Director MacDonald pledges to create a contingency plan that will detail the steps MWRA will take if the outfall produces violations of water quality standards. (Bob Hohler. "MWRA chief vows to develop plan to protect endangered species," *Boston Globe*, Jun 18, 1994, Metro Sec., p.79.)
- October 1994 MWRA study indicates potential savings of \$165 million in reducing secondary treatment capacity while still being able to attain water quality goals. (Scott Allen. "MWRA study says \$165 million can be saved," *Boston Globe*, October 25, 1994, Metro Sec., p.21.)
- November 1994 MWRA announces that delays in construction have added two years to the schedule. At this point, secondary treatment batteries would be completed before the outfall as fought for by the outfall opponents. (John Ellement. "Cape bid to stop pipeline rejected," *Boston Globe*, November 18, 1994, Metro Sec., p.38.)

- Massachusetts Supreme Judicial Court strikes down the three-year effort of STOP to prevent the construction of the outfall. The basis for the decision is that the outfall does not discharge into (as opposed to near) a marine sanctuary which is prohibited by law. (John Ellement. "Cape bid to stop pipeline rejected," *Boston Globe*, November 18, 1994, Metro Sec., p.38.)
- January 20, 1995 Deer Island Primary Treatment Plant comes on line. (Scott Allen. "Deer Island sewage-treatment plant opening a milestone," *Boston Globe*, January 20, 1995, Metro Sec., p.20.)
- October 18, 1995 Judge Mazzone approves the reduction in secondary treatment facilities allowing the elimination of Battery D citing engineering studies that showed demand was originally overestimated. (Scott Allen. "MWRA sewage facility reduced," *Boston Globe*, October 19, 1995, Metro Sec., p.29.)
- September 20, 1996 Outfall tunnel boring completed. ("Underground achievement," *Boston Globe*, September 21, 1996, Editorial Page, p.A14.)
- August 14, 1997 The first of three batteries of secondary treatment begins operation at Deer Island. (Peter J. Howe. "A new stage for cleanup of the harbor," *Boston Globe*, August 15, 1997, Metro Sec., p.A1.)
- January 1998 Second Battery of secondary treatment opens at Deer Island. ("New Deer Island plant opens," *The Patriot Ledger*, January 28, 1998, News Section, p.6.)
- February 4, 1998 EPA issues draft National Pollutant Discharge Elimination System (NPDES) permit to tentatively allow MWRA to conditionally use the outfall in the following November. Conditions include an extensive effluent and ambient water quality monitoring program. (Jessica Heslam. "Tight sewage rules issued," *The Patriot Ledger*, February 5, 1998, News Section, p.1.)
- July 8, 1998 Nut Island Treatment Plant shut down permanently. New Nut Island headworks begins screening and transport influent to Deer Island for treatment. (MWRA Monthly Compliance Report for June 1998 and Progress Report as of July 15, 1998, MWRA, 1998)
- May 20, 1999 EPA and Massachusetts DEP jointly issue MWRA an NPDES permit allowing use of their Massachusetts Bay outfall. (MWRA Monthly Compliance Report for May 1999 and Progress Report as of June 15, 1999, MWRA, 1999)
- The permit, the most stringent ever issued by EPA, includes extensive conditions on effluent monitoring and contingency plans. The permit also requires the MWRA maintain the existing Boston Harbor outfalls. (Executive Summary of Permit, U.S.EPA, www.epa.gov/region01/reginit/excssum.html.)
- June 16, 1999 MWRA Board votes to accept conditions of the NPDES permit. (MWRA Press Release, June 16, 1999)

CAAP Case Studies Framework

Objectives

The purpose of the case study analysis is to introduce a broader-track approach to infrastructure that acknowledges quality-of-life and environmental implications of infrastructure. Cases of infrastructure decision-making are documented using a framework that underscores this broader context. The results are presented in a form suitable for review and discussion by a practitioner audience in a workshop context. The outcome is to improve the ability of decision-making agencies and a broader set of stakeholders to manage infrastructure decision-making processes.

Issues and Problems

- Stakeholder participation in infrastructure decisions is usually considered limited, with information being held by only a few decision-makers.
- Where stakeholder participation occurs, criteria for stakeholder selection and participation are often unstated, ill-defined, narrow and not agreed upon.
- Where methods to identify broad stakeholder criteria and techniques for applying them in decision-making are absent, decisions will be made on narrow technical criteria alone.
- Decisions that do not engage a broad, agreed upon set of stakeholders often create conflict which delay projects and increases costs.

Case Documentation Elements

- **project description (scope and goals)**

The outfall tunnel project was just one component of a very large infrastructure system renewal – the Boston metropolitan area wastewater treatment system. After decades of harbor pollution and a political system unable or unwilling to admit that change was needed, a neighboring community initiated legal action to force the Commonwealth of Massachusetts to address the pollution (and comply with the CWA.) As a direct result of the lawsuit, the courts forced Massachusetts to create a new autonomous water and sewer authority. A subsequent lawsuit in federal court resulted in a court order requiring the new authority, MWRA, to implement a massive reconstruction program to ensure compliance with the CWA.

The scope of the outfall tunnel project was to design, site, construct and operate the final infrastructure component of the wastewater process. The outfall receives treated wastewater and transports it to a body of water for final dilution. To comply with CWA, both the outfall influent and the fully mixed discharge must meet certain water pollution goals. Maximizing initial dilution of the discharge aids in attaining those goals.

Siting of the outfall (specifically, the discharge outlet) was the most difficult part of this project and involved three variables – tunnel length, depth, and cost. The outlet site (determined by tunnel length and depth) must ensure adequate initial dilution and must ensure that discharged wastewater did not return to the harbor or its beaches, a severe problem that existed for decades and was actually alleviated by upgrading to secondary treatment. Cost of the outfall tunnel competes against both length and depth.

The ultimate goal was to balance the three variables while complying with CWA goals and obtaining the approval of the community (cost and permitting issues.) What makes this case controversial was when a community, not considered a host or user community, established themselves as hosts and contested the siting of the outfall.

- **decision-making process (i.e. formal decision-making model)**

Each component of the Boston Harbor cleanup project (secondary treatment plant, residue processing plant, residue landfill, and others) went through the EIS process as required per NEPA. This entails technical and environmental comparison of alternatives of selected possible solutions and includes comments from the community on selected alternatives.

- **broader informal and formal agency and political context**

The Boston Harbor clean up program was finally initiated after years of politically wrangling and inaction that left MDC severely underfunded to upgrade the infrastructure to attain CWA goals. Much of the problem was that MDC was a state agency and funding had to come through the state legislature. Legislators did not want to use funds for the ‘invisible’ sewer system, especially not legislators from western Massachusetts who did not want to subsidize Boston’s sewage problem. The courts intervened, much to the chagrin of the legislators, and forced the legislature to give up authority to a new public agency that the courts, in effect, could control.

Many layers of oversight approval agencies – EPA and MADEP had approval authority over most permits but each was indirectly affected or controlled by others. Gov. Weld had control over MADEP while EPA was more autonomous. That did not mean that they did not experience pressure from federal legislators.

- **decision points or points of intervention, such as a funding decision or granting of a permit**

Many community groups intervened through the courts. The Town of Quincy charging violations of the CWA filed lawsuit that forced the state to create MWRA. The Conservation Law Foundation also charging CWA violations filed lawsuit resulting in court ordered clean up. Lawsuits were filed by harbor communities to prevent outfall tunnel though the courts held that the communities intervened too late to protest. And finally, Cape Cod groups and whale conservationists filed lawsuits charging MWRA with violations of the Endangered Species Act.

EPA approval of Wastewater Conveyance System in 1988 after evaluating alternative locations of discharge outlet. Community participation was per the EIS process.

EPA NPDES permit. Issued in 1999, the ‘operating permit’ for the tunnel allows MWRA to discharge effluent through the tunnel. Like EIS process, NPDES permits allow public participation at certain points along the process. The permit for this discharge incorporated many of the concerns of community groups regarding monitoring of the discharge, the wildlife, and the potential farfield impacts on the Bay and included a contingency plan that would ‘close’ the tunnel if clean water violations were found.

Exec. Dir. MacDonald decided to restudy the potential impacts of the effluent discharge in 1992 (perhaps due to political pressure from Gov. and MADEP.) This occurred after all (?) approvals were in place and could have uncovered evidence of negative impacts on the environment potentially impacting tunnel progress.

There is also a decision regarding cutting back on secondary treatment capacity. The idea originated with MWRA as a savings for the ratepayers.

- **list of stakeholders and description of interests (see "Guiding Questions for Stakeholders")**

Attached (Appendix A.)

- **chronology of events**

Attached (Appendix B.)

- **analysis (see "Guiding Questions" below)**
- **preliminary statement of key points and lessons learned (for discussion)**
- **separate extraction of pre- and post-decision performance measures that reflects changing values and scales, where appropriate, over time (a separate analysis)**

Guiding Questions for Agencies

- **What are the missions/purposes of the agencies involved? Who defined them?**

The mission and purpose of the MWRA was determined by the courts and though enabled by the state, was not wholly backed by the state. The purpose of MWRA was to supply water and provide wastewater services to those metropolitan Boston communities that chose to pay for those services. Many communities had been part of their system for decades and their really was no alternative but to 'choose' MWRA for service. The MWRA mission is more along the lines of providing the service at no expense to the environment and little expense to ratepayers.

A reason MWRA was created served a specific purpose also. The agency that MWRA replaced (MDC) served the same purpose. MWRA, however, was created to be free from political and funding pressures. It is on this point where the courts and the state legislature disagreed.

- **What are the criteria used by the agency(ies) to judge their own organizational success?**

Guiding Questions: Host Communities and other Stakeholders

- **What are the expectations, interests, and desired outcomes for each stakeholder?**
- **How were stakeholder issues planned to be addressed in the course of the planning process?**

In the EIS process, stakeholder issues are raised during comment periods.

- **How were stakeholder issues in fact raised in the course of the case?**

For the Cape Cod groups (STOP) and conservationists, issues were raised through political pressure and the media. STOP raised the issue that no public hearings had been held south of Quincy which excluded the Cape Cod community from being informed of meetings.

- **What were the gaps between what the agency proposed to do and what the host communities wanted done?**

There was an enormous gap between MWRA's proposed outfall and what the Cape Cod groups wanted. STOP wanted to put a halt to the outfall altogether and instead install tertiary treatment keeping the sewage solution in the Boston area. This also represents a gap between what the Boston communities wanted as well which was to send the 'problem' away.

Guiding Questions for Case Projects

- **What was the agency's original objective or intent for the case project?**

The Massachusetts Bay outfall tunnel was first proposed as part of a system upgrade in 1979. The outfall was part of the technical solution, including the very procrastinated upgrades to primary treatment standards, proposed by Massachusetts to address the harbor pollution problem. The proposal was rejected by EPA, in total, because it would not ensure compliance with the CWA. In the interim, MWRA was created and in 1985, a new proposal that included secondary treatment coupled with the outfall tunnel was considered by EPA.

The outfall is how wastewater is returned to the environment. It is meant to carry wastewater away from human development. It was always part of the overall wastewater treatment plan. Only the final location of the outlet was undecided (but was believed to be 7 to 10 miles from the harbor.) MWRA's intent was to satisfy the court order (which required attaining CWA goals in accordance with a specific schedule) and to do so with minimum expense to the ratepayers.

- **Who participated in the development of the original objective or intent?**

The tunnel was originally developed as the technical solution to transport treated wastewater back to the environment and away from human development. Ocean dumping of wastes was common and use of a tunnel to carry waste out to the ocean was a tried and accepted technical solution. There was not much participation by any other groups specifically regarding the tunnel because of its perceived relative significance to the entire clean up program. The agency's tunnel objectives were much less important than the objectives regarding level of treatment and the overarching goal of cleaning up the harbor and the beaches. Political and community participation in the decisions occurred at that level.

- **What were the criteria by which success was to be judged by the agency?**
- **What conflicts arose in the course of the case, and what caused them?**

The major conflict was between the Cape Cod community and MWRA, EPA and Judge Mazzone.

- **Did the project experience a change of course and if so, what caused it?**

The final outcome of the project did not change. The outfall will function as originally determined and where it was first approved by EPA. There were some unexpected changes in the performance measures that will impact the system and how the agency operates. MWRA restudied the effluent impacts midcourse potentially threatening tunnel progress and usage. It was unknown what the results of the studies would indicate and what the outcome would be. Without the Cape Cod community's protests, there may have not been a second look at the tunnel impacts, something EPA vigorously protested.

Because of the community protests and the associated political pressure, the NPDES permit, which controls the systems final output and the agency's performance, is the most stringent ever. It includes strict and far reaching requirements for water quality monitoring and contingency plans. These were not envisioned at the outset but were the result of public participation and some political pressure.

- **What was/is the ultimate/ongoing outcome?**

Outfall tunnel is built, permitted and very close to operation. It exists where and will function as it was intended. The NPDES permit however, allows the possibility for the outfall tunnel to be shut down.