



## **NEW BEDFORD HARBOR: Discussion and Debate**

### **Where does New Bedford stand today and how we can shape its future?**

#### **OBJECTIVES:**

1. To facilitate research and discussion about how New Bedford became contaminated with PCBs.
2. Students will conduct research and will make educated decisions about the PCBs located in New Bedford Harbor and the Acushnet River and possible cleanup options.
3. Students will be able to take information learned during their research to effectively debate and convince classmates of their point of view.

#### **GRADE LEVEL**

9-12

#### **PRE-ACTIVITIES:**

Students will conduct research that focuses on the ecological history of New Bedford Harbor; the current status of New Bedford Harbor as a Superfund Site; the proposed remediation techniques; and the economic and safety concerns associated with exposure pathways to PCBs. The students will then be faced with two topics and will be asked to review the issues surrounding dredging the PCBs from the harbor or capping/leaving the PCBs in-situ. The students will be placed into one of four groups debating the economics and safety concerns of removing the PCBs and the ecological impacts of PCB removal. Finally, the students will prepare and conduct a debate where they will use the information they have gathered to help defend their arguments and come to a consensus about how to best help all who use New Bedford Harbor as a home or place of business.

#### **MATERIALS:**

1. Students will need access to a media center that contains computers with Internet access and books about New Bedford Harbor.
2. A copy of the EPA dewatering facility packet to help understand how the contaminated sediment is cleaned, filtered and what happens to the waste material.
3. Go Fish game and material
4. Fish Smart brochures
5. Any additional materials as the instructor see fit to facilitate understanding or research (exposure pathways).



## ACTIVITIES:

### Part One – Research and Decisions (2 Days)

#### Day One

1. Students will be introduced to the project and will be informed that they are to complete a basic research project on the ecological impacts on New Bedford Harbor. Students will learn that there are many factors that have contributed to the ecological decline of the harbor.
2. Have the large aerial map of the harbor on display and help the students recognize features of the harbor before you start.  
*Students should be able to identify the Acushnet River; Industries that contributed to the PCB contamination; areas of greatest contamination; and barriers to natural flushing of the harbor - the hurricane barrier.*
3. Prior to conducting the research, hold a discussion to assess their prior knowledge and make a list of all the things they think may have impacted the harbor. Have the students keep this list as a reference for later.
4. Explain the background of how the Acushnet River and New Bedford harbor became contaminated with PCB's to the students.
5. Discuss the overview of the Superfund program and the Fish Smart campaign will be with the students.
6. Have the students play the “Go Fish” game using the large classroom maps or in groups with the smaller maps.
7. Once the students understand the purpose of the Fish Smart campaign explain the concepts of exposure pathways and bioaccumulation.
8. Give the students the New Bedford Harbor word splash for homework and allow them to creatively connect the words into sentences using the new information they learned in class.

#### Day Two

1. Have the students review their homework.
2. Next, the students will be given the list of websites to review to help guide their online research to ensure they find all the necessary information for their subsequent debates.



3. The students can be assigned to a debate to help facilitate their research. If they are not pre-assigned this will be general research and more time will be needed (in class or at home) to find debate specific arguments.
4. The students will be required to take notes and references for any websites they visit. They will submit their notes at the end of the day or complete it for homework and bring it in the following day.

### Part Two – Debate Preparation (2 Days)

#### Day Three

1. As class starts the next day, poll the students about their thoughts on the hurricane barrier and the contamination of harbor sediments by PCBs. After the poll, explain to the students that they will have to debate the topic of cleaning up the harbor. The students will need to be assigned to either side of the debate. The class will be split into groups of 6. This allows for approximately 4 groups. Two debates will be held. Each debate should last about 20 minutes to allow the audience to comment on each debate.
2. Two groups (pro and con) will debate the economics and safety concerns associated with dredging the PCBs from the harbor or capping/leaving the PCBs in-situ.
3. The other two groups of students will be debating (pro and con) the ecological impact of dredging the PCBs from the harbor or capping/leaving the PCBs in-situ.
4. In order to accomplish these tasks the students will be provided time to work in class as a group and will be provided access to all research materials if necessary. No longer than one class period should be devoted to debate preparation.
5. To provide a record of their participation within the group each student will be required to complete a debate task list that has at least ten facts or arguments to support their case. This will be handed in as part of the assessment.

#### Day Four

1. Once all groups are ready the debates will begin. Students should either have experience debating or will need to be provided with instructions on how to debate. (See rubric)
2. One set of students will complete their debate including opening statements and closing arguments. The rest of the students should listen and act as audience members.



3. The next set of students will complete their debate. The remaining students will listen and act as audience members.
4. After each debate the audience members will be asked to critique the other debate, discuss what they learned from listening to the debate, if they changed their position on the issue and if there was a clear “winner” from the debate.

### **FINAL DEBATE & EVALUATION**

The students will conduct a final debate each as a member of one of four groups:

- Pro or Con on the economics and safety concerns associated with dredging the PCBs from the harbor or capping/leaving the PCBs in-situ;
- Pro or Con on the ecological impacts of the dredging of PCB's from the New Bedford Harbor or capping/leaving the PCBs in-situ.

Students will be evaluated on their role within the debate, their level of participation and their preparedness of material and evidence for the debate. They will submit debate notes after the assignment is completed. An example rubric is provided at the end of this lesson plan as a guideline for evaluation.

### **DESIRED OUTCOME:**

- The students will understand the Superfund cleanup process and New Bedford Harbor as a Superfund Site.
- The students will learn about the history of New Bedford Harbor and the possibilities for its future.
- The students will learn what PCB contamination is.
- The class will understand the importance of environmental protection and the challenges of cleaning up environmental contamination. The aftermath of pollution and contamination is extremely challenging to deal with, stopping pollution before it happens is much safer for public health and the environment and less costly in the long run.

### ***State Content Standards:***

- LS17 (6-8) Identify ways in which ecosystems have changed throughout geologic time in response to physical conditions, interactions among organisms, and the actions of humans.
- LS 6.4 (9-12) Explain how water, carbon, and nitrogen cycle between abiotic resources and organic matter in an ecosystem, and how oxygen cycles through photosynthesis and respiration.
- SIS1. Make observations, raise questions, and formulate hypotheses.
- SIS3. Analyze and interpret results of scientific investigations.
- SIS4. Communicate and apply the results of scientific investigation.



### *Notes to Teachers*

The following websites should be used to help the students conduct their online research and prepare for their debates:

- [www.epa.gov/nbh/](http://www.epa.gov/nbh/)
- [www.epa.gov/nbh/html/glossary.html](http://www.epa.gov/nbh/html/glossary.html)
- [www.epa.gov/nbh/html/studies.html](http://www.epa.gov/nbh/html/studies.html)
- [www.hudsoncag.ene.com/files/Final%20Summary%20for%2010-27-05%20CAG%20Meeting.pdf](http://www.hudsoncag.ene.com/files/Final%20Summary%20for%2010-27-05%20CAG%20Meeting.pdf)
- [www.ehponline.org/members/2004/6934/6934.html](http://www.ehponline.org/members/2004/6934/6934.html)
- [www.ci.new-bedford.ma.us/DPW/Wastewat/hurricane.htm](http://www.ci.new-bedford.ma.us/DPW/Wastewat/hurricane.htm)
- [www.rixsan.com/nbvisit/attract/hurrcane.htm](http://www.rixsan.com/nbvisit/attract/hurrcane.htm)
- [www.newbedford.com/chrono.html](http://www.newbedford.com/chrono.html)
- [www.epa.gov/region01/superfund/index2.htm](http://www.epa.gov/region01/superfund/index2.htm)
- [www.epa.gov/superfund/news/newbedford.htm](http://www.epa.gov/superfund/news/newbedford.htm)
- [www.darrp.noaa.gov/northeast/new\\_bedford/index.html](http://www.darrp.noaa.gov/northeast/new_bedford/index.html)
- [www.buzzardsbay.org/newbed.htm](http://www.buzzardsbay.org/newbed.htm)
- [www.weitzlux.com/environmentallawsuit/massachusetts/newbedford\\_145917.html](http://www.weitzlux.com/environmentallawsuit/massachusetts/newbedford_145917.html)

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