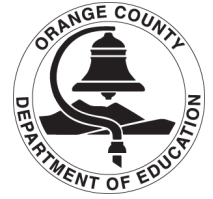




# Protecting the Quality of the Rockflower Reservoir Classroom Activity



## SYNOPSIS

In this activity, your students will examine the conflict from the perspectives of the homeowners, the water users, and the water supplier; they will discuss options, and they will try to agree on what to do.

## OBJECTIVES

Students will:

- Examine the impact of local government entities, such as planning commissions, on local decisions
- Examine the interconnection of local decision-making with state and federal regulations
- Explore issues that must be addressed by government when making a public policy decision
- Examine a situation in which taking care of the many might have direct negative impact on a few

## MATERIALS

- Student Books
- *What Really Happened: The Rockflower Reservoir*

## Teaching Notes

There is no right or wrong answer to this activity. This activity introduces an important concept: Through a democratic society, the majority must take responsibility for protecting the rights of the minority – but that does not always mean going along with the desires of the minority. That concept should be emphasized throughout this lesson.

## Pre-Activity Homework Assignment

Ask the students to read the introduction of their student book and answer the review questions.

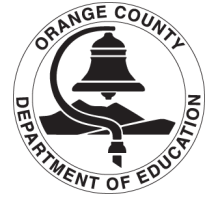
## Overview

The Interests of Many Versus the Interests of Few

This activity illustrates a common social dilemma: a conflict that will either do harm to a few people or harm to a large number of people. Water entering the reservoir has already been disinfected with chlorine. In the open reservoir, the chlorinated water comes in contact with naturally occurring organic materials, such as leaves and twigs. The chemical interaction between chlorine and organic materials in water results in the formation of the by-product trihalomethanes (THMs). Although the risk is extremely slight, THMs are suspected to be carcinogenic. The U.S. Environmental Protection Agency (EPA) is re-evaluating the acceptable limits of THMs in the public water supply, and as a result, at some point in the future, the reservoir's water will not meet the new federal health standards.



# Protecting the Quality of the Rockflower Reservoir Classroom Activity (cont.)



To comply with the new regulations, the reservoir will have to be upgraded or closed, and there are three serious options for what to do:

## 1. Build a Treatment Plant

A treatment plant would require building a new facility. While the facility would not be visible to the homes overlooking the Rockflower Reservoir, it would be visible to some homeowners nearby. In addition, siting a facility such as a treatment plant can present other problems, such as chemical storage and wildlife protection. Furthermore, the water entering the Reservoir has already been treated; building an additional treatment plant would result in the water being treated twice, and double treatment could present an additional financial burden on water customers, raising their monthly bill by as much as \$8.75. Lastly, the treatment plant is by far the most expensive of the three options.

Cost: \$100 million for construction, \$12 million annually for maintenance

## 2. Cover the Reservoir with a Floating Plastic Cover

Covering the reservoir with a floating plastic cover would prevent the formation of THMs, but it would also eliminate the water view from nearby homes, an important benefit to some homeowners. Covering the reservoir is the least expensive option. This would also have an impact on the wildlife that use the reservoir.

Cost: \$17 million to install, \$2.5 million for annual maintenance

## 3. Close the Reservoir

Closing the reservoir would solve the THM problem, but it would strain the existing water delivery system in a number of ways. Reservoirs store water when it is available so there is an adequate water supply during dry periods. The reservoir stores water so the families within its service area can be confident there will be water every time they turn on the faucet. The water supply system to that region does not have excess water, so taking the reservoir out of service could reduce the reliability of the water supplies for about one-half million people. Excess water storage is also particularly important in the event of an emergency, such as an earthquake. Taking the reservoir out of service is simply not practical.

Cost: Unknown. If the reservoir were closed, it would still require maintenance. It is unclear who would pay for this maintenance if the reservoir were no longer part of the water delivery system.

## LESSON PLAN - DAY 1

### 1. Briefly review the homework reading by discussing the review questions.

Q - Why is the Reservoir important to the regional water supply system?

A – The reservoir supplies water to about 500,000 water customers in Southern California. In addition, as a reservoir, it helps balance fluctuations in supply and demand within the system.

Q – Why have trihalomethanes (THMs) become an issue related to the Reservoir?

A – Because THMs are a suspected carcinogen and might cause cancer among a small percentage of the population.

Q – What are the three options to limit the THMs in the Reservoir, and what are the benefits and drawbacks of each?

A – The three options are to build a treatment plant, cover the existing reservoir or close the reservoir completely. The benefits and drawbacks are discussed in the overview and the student book.

Q – Why are the homeowners near the Reservoir concerned about this issue?

A – They are upset that they will lose their water view, and that their property values will decline.



# Protecting the Quality of the Rockflower Reservoir Classroom Activity (cont.)



## LESSON PLAN - DAY 1 (continued)

2. Select up to six students to serve on the “Commission.” Ask them to reread the pages of the student book carefully.
3. Divide the rest of the class into three additional groups: homeowners, water users and the water utility.
  - **The Homeowners** will argue that the utility should select an option that does not eliminate their views and possibly cause their property values to drop, regardless of the cost to the whole system.
  - **The other water customers** will try to convince the Commission to select the most cost-effective option; that is, the one that will keep their water clean, safe and affordable.
  - **The water utility** will want a clear decision on the part of the Commission so they can begin correcting the situation. Ideally, they will want the most cost-effective option that will require the least amount of time to license and build.
4. Instruct each group to become familiar with their positions by carefully reviewing the pertinent information in the 1) Interest Group and 2) Letters section of the Student Book. Instruct the Commissioners to become familiar with all of the information and all of the letters.

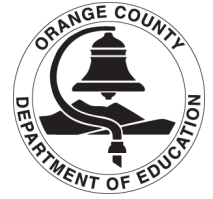
**Note #1:** It should be the decision of each interest group whether or not they become familiar with the positions of the other groups. Those who do will be in a strong position because they will have a chance to discuss counterarguments.

**Note #2:** The letters contained in this section were selected from Volumes 1 and 2 of the “Environmental Impact Report”

5. Allow the groups 10-15 minutes to examine and study the information in the packet and to prepare a brief presentation to the Commission. While the three interest groups are discussing the information specifically related to them, the Commissioners should discuss the relevant information and be familiar with all three perspectives. In addition, instruct the members of the Commission to prepare 6 to 10 questions to ask the various interest groups.
6. Hold a meeting of the Commission. Arrange the classroom so each of the three groups face the commissioners. Select a chairperson of the Commission to oversee the meeting. Have the chairperson maintain order so all parties feel that their positions are being heard.
7. Allow the rest of the class period for the meeting of the Commission. During the meeting, each group should present their positions to the commissioners. Allow time for rebuttals or counterarguments. Encourage the commissioners to ask questions of the groups. They should ask the questions they prepared as well as any questions that may come up.
8. At the end of class, tell your students that they will have the opportunity to clarify their positions or strengthen their arguments at the beginning of the next class.



# Protecting the Quality of the Rockflower Reservoir Classroom Activity (cont.)



## LESSON PLAN - DAY 2

1. At the beginning of the class (with students back in their groups), ask if anyone would like to contribute anything new to the last class discussion.
2. Allow the commissioners time to conduct a brief “open meeting” to discuss the available options. Be sure everyone stays attentive during this open discussion. Explain to the class that an open meeting is a discussion where the Commission can explore its views publicly, thus remaining accountable to the public’s best interest.
3. Have the chairperson take a roll-call vote from the members of the Commission about what should be done with the Reservoir. You may want to ask each Commissioner to explain the rationale behind their vote.
4. Disband the Commission, and ask each commissioner to join one of the interest groups.
5. Have each student write a one-page essay on the impact of the Commission’s vote on them (in relation to the interest group they were assigned to).

**Suggestion:** Consider allowing your students up to a full class period to lobby the members of the Commission after they have identified their position. Either as homework or an in-class assignment, you may want to have interest group member write a brief “letter of persuasion” to the members of the Commission.

6. After the students have finished writing their essays, have each group read “What Really Happened: The Reservoir.”

## EXTENSIONS

1. Have your students identify and discuss other situations in which a few people might be harmed by an action that benefits the many (for example, homeowners whose homes face a new freeway, or who find themselves living near an electric power plant).
2. Research current events about one or more of the following topics:
  - THMs and disinfection by-products
  - Situations in which very few people influence what happens to a great many people, such as civil rights legislation, Medicare and Social Security cutbacks, or auto and health insurance price increases.Spend a portion of one class period discussing these issues, clarifying their evolution, and placing them into the perspective of life and responsibilities in democratic society.
3. Are there other options to deal with the issue of THMs in the reservoir? Could the options change over time? What could impact these changes?

### What Really Happened: The Reservoir

The Commission voted to cover the Reservoir. The plan calls for the installation of a floating Hypalon cover over the reservoir's surface. Hypalon is a nylon-reinforced, synthetic mater similar to rubber.

One of the Commission members, who represents much of the area served by the reservoir, stated "Placing a floating cover on the reservoir is the most cost-effective and environmentally responsible method to correct its long-standing problems."

To address some of the homeowner' concerns, the water district will upgrade the landscaping in the selected areas around the reservoir with dense plantings of trees and shrubs to screen low horizon views of the reservoir. The additional landscaping is estimated to cost \$375,000.

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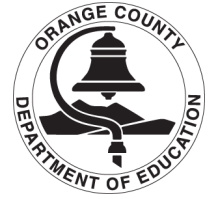
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# Protecting the Quality of the Rockflower Reservoir - Quiz



## Circle the best answer.

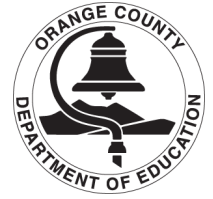
1. The opposition to covering the reservoir come primarily from:
  - A. public health specialists.
  - B. nearby homeowners.
  - C. environmentalist.
  - D. local politicians and county supervisors.
2. The three options for ensuring that the reservoir's water meets EPA standards are:
  - A. covering the reservoir, working with the EPA to raise the allowable limits of THMs, and building a treatment plant.
  - B. building a treatment plant, continuously aerating the water, and covering the reservoir.
  - C. covering the reservoir, taking the reservoir out of service, and building a treatment plant.
  - D. EPA standards are constantly changing; therefore, there is no way of ensuring that the reservoir will meet the standards regardless of how they change.
3. THMs in the reservoir must be controlled because:
  - A. they give drinking water a bad flavor.
  - B. they are suspected of being carcinogenic.
  - C. they cause water to become discolored.
  - D. algae cannot grow in water containing THMs.
4. THMs must be limited because of regulations imposed by
  - A. the Metropolitan Water District.
  - B. Southern California.
  - C. the California Department of Water Resources.
  - D. the U.S. Environmental Protection Agency.

## Short Answer

5. People living in the homes around the reservoir drink the water from the reservoir and they want it to be healthy. Why do some of them object to the covering of the reservoir?
  
  
  
  
  
  
  
  
  
  
6. In a democracy, it is said that "the majority rules." What exactly does this mean? Should the desires of the many always win out over the desires or needs of a few? If that happened, how would society take care of its feeble and sick? How would minority populations have a voice? How much should the majority of the population sacrifice to ensure the well-being of the minority?



# Protecting the Quality of the Rockflower Reservoir - Answers



## Circle the best answer.

- The opposition to covering the reservoir come primarily from:
  - public health specialists.
  - nearby homeowners.**
  - environmentalist.
  - local politicians and county supervisors.
- The three options for ensuring that the reservoir's water meets EPA standards are:
  - covering the reservoir, working with the EPA to raise the allowable limits of THMs, and building a treatment plant.
  - building a treatment plant, continuously aerating the water, and covering the reservoir.
  - covering the reservoir, taking the reservoir out of service, and building a treatment plant.**
  - EPA standards are constantly changing; therefore, there is no way of ensuring that the reservoir will meet the standards regardless of how they change.
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  - algae cannot grow in water containing THMs.
- THMs must be limited because of regulations imposed by
  - the Metropolitan Water District.
  - Southern California.
  - the California Department of Water Resources.
  - the U.S. Environmental Protection Agency.**

## Short Answer

- People living in the homes around the reservoir drink the water from the reservoir and they want it to be healthy. Why do some of them object to the covering of the reservoir?

**They object because it will eliminate their water views, possibly causing their property values to decline. In addition, they bought their homes with the understanding that they had water views; therefore, some of them contend that taking away the water views would represent a breach of contract on the part of the seller.**
- In a democracy, it is said that "the majority rules." What exactly does this mean? Should the desires of the many always win out over the desires or needs of a few? If that happened, how would society take care of its feeble and sick? How would minority populations have a voice? How much should the majority of the population sacrifice to ensure the well-being of the minority?

**"Majority" rule may be thought of as being a weak link in a democracy, because the minority may be deprived of their voice. It is, however, an inevitable weak link. The majority must operate with compassion and sacrifice, even when that means that some individuals may be penalized.**



# Protecting the Quality of the Rockflower Reservoir



## The Interests of Many Versus the Interest of a Few

### Introduction and Background

The Rockflower Reservoir is a fictitious water supply reservoir located in southern California. It is concrete lined, moderately large (covering 55 surface acres), and it holds about one billion gallons of water. Most important, it is a significant link in the water supply chain for about 500,000 people living in southern California. Specifically, the reservoir supplies some of the drinking water to southern California, and it provides all the water for Newport Beach.

When first built, the reservoir complied with every water quality regulation. But over the years, some of the regulations have become stricter, and the reservoir must continually be upgraded. In addition, several local water districts rely on the Metropolitan Water District to operate the reservoir. Their ability to provide safe and affordable water to the customers depends upon the Metropolitan Water District's ability to operate the reservoir in a cost-effective manner while continuing to meet all the environmental and health regulation.

The problem with the reservoir has to do with water chemistry and other things, such as bird droppings. To be drinkable and safe, water must be disinfected, a process that kills unwanted bacteria. The water in the Reservoir is disinfected with chlorine, one of the most effective and well understood disinfectants. When natural organic materials, such as leaves, sticks, or soil, interact with chlorine in water, however, chemical by-products result. Some of these by-products are trihalomethanes, or THMs, a suspected carcinogen. In response to this problem, the U.S. Environmental Protection Agency (EPA) limits the level of THMs allowed in drinking water.

### Possible Solutions

There are three ways to limit the amount of THMs in the water of the reservoir; each solution has problems:

#### 1. Build a Treatment Plant

A treatment plant would require building a new facility. While the facility would not be visible to

the homes overlooking the reservoir, it would be visible to some homeowners nearby. In addition, siting a facility such as a treatment plant can present other problems, such as chemical storage and wildlife protection. Furthermore, the water entering the reservoir has already been treated; building an additional treatment plant would result in the water being treated twice, and double treatment could present an additional financial burden on water customers, raising their monthly bills as much as \$8.75. Lastly, the treatment plant is by far the most expensive of the three options.

**Cost:** \$100 million for construction, \$12 million annually for maintenance.

#### 2. Cover the Reservoir with a Floating Plastic Cover

Covering the reservoir with a floating plastic cover would prevent the formation of THMs, but it would also eliminate the water view from nearby homes, an important benefit to some homeowners. Covering the reservoir is the least expensive option. This would also have an impact on the wildlife that use the reservoir.

**Cost:** \$17 million to install, \$2.5 million for annual maintenance

#### 3. Close the Reservoir

Closing the reservoir would solve the THM problem, but it would strain the existing water delivery system in a number of ways. Reservoirs store water when it is available so there is an adequate water supply during dry periods. The reservoir stores water so the families within its service area can be confident there will be water every time they turn on the faucet. The water supply system to that region does not have excess water, so taking the reservoir out of service could reduce the reliability of the water supplies for about one-half million people. Excess water storage is also particularly important in the event of an





# Protecting the Quality of the Rockflower Reservoir

emergency, such as an earthquake. Taking the reservoir out of service is simply not practical.

**Cost:** Unknown. If the reservoir were closed, it would still require maintenance. It is unclear who would pay for this maintenance if the reservoir were no longer part of the water delivery system.

The problem is complicated by the fact that a subdivision of high-priced homes has been built along one side of the reservoir, and those homes have a water view. The land around the other three sides of is totally undeveloped. The homes with the water view command a premium price, as much as 20% more than a comparable home without a view. The residents want the reservoir to remain as it is. In addition, when the homeowners bought their homes, they specifically bought homes with “water views”; removing the water view (by covering the reservoir) could pose legal problems.

For the purpose of this activity, you will try to decide what to do with the reservoir. Assume that the local water agencies responsible for distributing the water from the reservoir have established a “Blue Ribbon Commission.” This Commission has been charged with the task of finding a solution to the problem of what to do with the reservoir and THMs. Thus, as in real life, local interests will explore and discuss the options in a public forum and make a decision.

## Review Questions

1. Why is the reservoir important to the supply system?
2. Why are the trihalomethanes (THMs) become an issue related to the reservoir?
3. What are the three options to limit the THMs in the reservoir, and what are the benefits and drawbacks of each?
4. Why are the homeowners near the reservoir concerned about this issue?

## The Activity

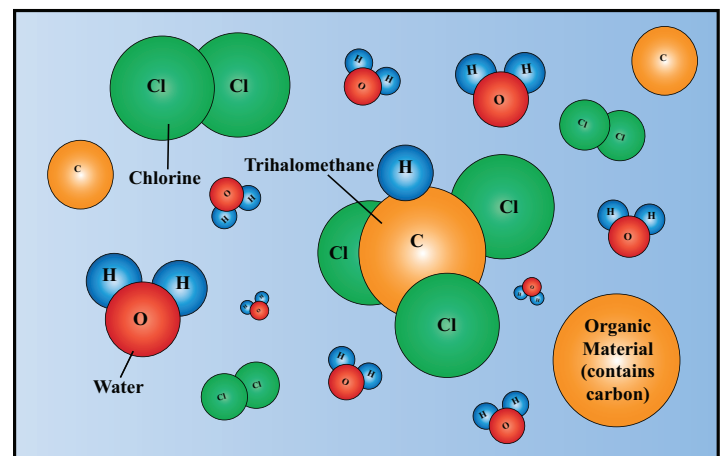
The “Blue Ribbon Commission” must decide whether or not to cover the Reservoir. They will make the decision by majority vote, and they will base their vote on information they receive from three different groups: homeowners near the reservoir, other water users in the immediate area, and the water utility company.

Your teacher will assign you to either the Commission or one of the three interest groups.

The homeowners group will argue that the utility should select an option that does not affect their views and possibly cause the property values to drop, regardless of the cost to the whole system. The other water customers group will try to convince the Commission to select the most cost-effective option, that is, the one that will keep their water clean, safe, and affordable.

The water utility group will want a clear decision on the part of the Commission so they can proceed with correcting the situation. Ideally, they will want the most cost-effective option that will require the least amount of time to license and build.

**Instructions for the Commissioners:** Become familiar with the background of the situation and the position of each of the interest groups by carefully reviewing the Introduction and Background section of this activity and the information contained in each group’s information packet. Once you are familiar with the situation, prepare 6 to 10 questions to pose to the groups during the meeting of the Commission.



When water containing carbon in the form of organic materials is chlorinated, all the elements necessary for the formation of THMs are present.



# Protecting the Quality of the Rockflower Reservoir

**Instructions for the interest groups:** The information that follows contains the issues pertinent to the three groups as well as several letters about the project, both for it and against it. (These letters, incidentally, were excerpted and paraphrased from public record about this project; they are part of the Environmental Impact Report.) You will have about 10 minutes to examine and study the information and prepare a presentation for a mock meeting of the Commission. (in some cases, group members may have differing opinions; it is okay for you to disagree with members of your own group.)

Each group will present its position to the Commission, and once the Commissioners have listened to all the arguments, they will vote on what to do. Each of you will then write an essay on the long-term impact of that decision on you.

## Interest Group Positions

### Homeowners

1. Installing a cover will eliminate views.
2. Houses in this area may not sell until this problem is resolved, so you are being hurt and the utility should make decision as quickly as possible.
3. Wind blowing across the cover could create noise problems for the community.
4. The Environmental Protection Agency constantly changes the regulations for the trihalomethanes, so a cover for the reservoir for trihalomethanes, so a cover for the reservoir may not have a useful life for more than 10 or 15 years.
5. The seams of the plastic sections will probably fail eventually. In addition, the cover will require a great deal of maintenance.
6. The cover will completely cover the reservoir and it will become full of debris, soot, dead animals, etc. It will be an eyesore and it will be dangerous.
7. A water treatment plant may cost more in the short term, but it makes a lot more sense for the long term, and each water user's investment will only amount to a few dollars. In addition, a water treatment plant will definitely create the least environmental impact.
8. When you bought the property, the realtor advertised it as having a water view. If "they" allow the water view to be removed, you'll sue.

### Other Water Customers

1. Closing the reservoir is just too risky. It will reduce your water storage capacity, which you need during dry periods and in case of emergencies.  
(Note: 2 and 3 disagree with each other; there is often disagreement within any group, and water users are certainly not a unified body.)
2. You already pay too much money for water. You don't want to have to pay more for a treatment plant, because all you will be doing is paying more money to protect the property values of people who live in expensive homes.
3. It's just not fair for a large water utility to run roughshod over homeowners, destroying their investments and their quality of life. It's worth a few extra dollars each year to build a treatment plant; it's the right thing to do.

### The Water Utility

1. The reservoir must be properly chlorinated to stay within legal regulations, to prevent disease, and to keep the reservoir healthy and clean. As long as this reservoir remains operational and uncovered, we will have problems with THMs.
2. Covering the reservoir is by far the most cost-effective option.
3. Your job is to provide water that meets all water quality standards at a price that everyone can afford.

Suggestion: If there is a stalemate and you cannot make any progress, or if the landowners specifically request compensation for the loss of a water view, you may negotiate for some compensation.



# Protecting the Quality of the Rockflower Reservoir

## Comments from people **OPPOSED TO** covering the reservoir

### **A Homeowner**

We purchased our home 10 years ago at a high price with confidence that we could enjoy the water view. Now we are faced with the threat of an unsightly cover that will substantially destroy our view and significantly reduce the resale value of our property...The anticipated regulatory demands for improvement in water quality in future years justify building a new water treatment facility...

### **A Coalition of Homeowners**

Most of our homes were originally sold as “waterfront.” We, the undersigned, pledge to keep our community as it was marketed to us by the builders and lenders. As an alternative, we support the construction of a water treatment plant on an appropriate site.

### **A Local Homeowner**

If we are going to use cost as the final basis for all these hearings, then there is no point in this meeting, and there is no point in having a democracy.



## Comments from people **IN FAVOR OF** covering the reservoir

### **The City of Orange**

A new treatment plant makes no sense when there are less expensive and less troublesome solutions at hand. We support the covered reservoir alternative as the most cost-effective solution which addresses and resolves the important water quality and supply issues. While we are sensitive to the aesthetic needs of those whose homes overlook the reservoir, we believe that the health and well-being of the many outweigh the aesthetic benefit provided to a few.

### **A Water-user from a Nearby Community**

I cannot see that it is reasonable to ask 100,000 people to pay for someone else’s reservoir view...We in southern California have our views, too, but we don’t think that others should pay for them. I ask that you consider the most cost-effective solution to the Rockflower Reservoir, not the most costly.