

FINAL VERSION

**Low Dose Risk Perception and Communication:
A Case Study of the Tritium Controversy at Brookhaven National
Laboratory**

Thomas Webler
Social and Environmental Research Institute
P.O. Box 253
Leverett, Massachusetts 01054
twebler@crocker.com

September 10, 2002

Abstract

This manuscript reports on how individuals in and around Brookhaven National Lab came to their perceptions of a low-dose radiation risk from tritiated water that contaminated the groundwater aquifer directly beneath the Lab. The focus is upon the role that risk communication messages played in forming individuals' perceptions. Based on the presumption that people interpret and deliver such messages via interactive processes with others, this research inquired into: (1) the ways that different social networks distributed and processed information about the risk, (2) the way that interaction in such networks shaped individuals' risk perceptions of the tritium, and (3) the role radiation stigma and regulatory standards played in influencing risk perceptions. The report identifies three key social networks and examines each independently, but also explores how the networks intermingled. The report finds that, in this case study, people who decided to become engaged in the tritium risk controversy relied on the resources of social networks to acquire and evaluate information. Social networks served to filter and channel technical information and expert interpretations of that information to members. Also, networks offered members opportunities to collect peer feedback on opinions about the risk and the controversy. These findings suggest that theories of risk perception, in addition to their present focus on the psychological level, need to develop a sociological dimension to capture the relevance social networks play. The findings also suggest that the practice of risk communication needs to recognize that risk messages are interpreted socially. Conceptualizing a risk discourse among all interested parties seems to be a promising way to think about risk communication.

Table of Contents

Abstract.....	1
Table of Contents.....	2
Chapter 1. Introduction and Background to the Case Study.....	5
Entrée to the Case	5
Origins of Brookhaven National Laboratory	6
Precursors to the tritium controversy	8
Shoreham Nuclear Power Station	8
Historical releases of tritium to groundwater.....	10
The Tiger Team Investigation.....	11
The Tristan Fire.....	12
Dewatering at the Sewage Treatment Plant	12
Outline of this report.....	12
Chapter 2. Research Design and Methodology Used in the Case Study	14
Research Design.....	14
Case Selection.....	14
Desired participants	15
Interview Guide	15
Human Subjects Protection.....	15
Methodology	15
Definition of the community.....	15
Data Collection and Analysis.....	16
Archival Data Gathered	16
Interviewees	17
Data Analysis	19
Chapter 3. The Tritium Controversy.....	20
Unfolding of the tritium controversy	20
Factors that helped propel the tritium controversy to crisis status.....	21
The brilliant scientists “goofed up”	21
Changes in Leadership.....	22
A culture of “in-your-face” controversy	23
Other contamination events	23
Complications due to BNL’s and DOE’s responses to the controversy	24
Key participants and parties to the tritium controversy	24
The Suffolk County Task Force (SCTF)	24
Civic Organizations	25
Establishment of CALA (Community Activists for Lab Accountability)	26
Birth of STAR.....	26
DOE’s and Brookhaven’s Risk Communication Efforts	27
DOE Oversight of BNL risk communication	27
Brookhaven Executive Roundtables (BER).....	28

DOE’s HFBR Roundtable Workshops	29
Poster Sessions.....	31
Meetings with civic organizations	32
Canvassing the Community	32
The Rise of the Community Working Group (CWG)	33
The grant that destroyed the CWG	33
Post-Tritium: The Community Advisory Council (CAC)	34
Chapter 4. Findings: The Role of Social Networks in Shaping Risk Perceptions.....	35
Friends of BNL Network	35
Characterization of the network.....	35
Perceptions of risk: Human health risks from the tritium in groundwater	37
Information shaping risk perceptions among the Friends of BNL network	38
Risks to Human Health from the Remediation of the Tritium-Contaminated Groundwater	40
Learning about the risks: Education within the Friends of BNL network.....	41
Factors Shaping Risk Perceptions for Friends of BNL network.....	43
Community Residents Network.....	45
Characterization of the network.....	45
Perceptions of risk: Links to organizational practices	47
Learning about the risks: Education within the Community Residents network.....	49
Factors Shaping Risk Perceptions for Community Residents network	53
Relationships with other networks.....	55
Long Island Activists Network	57
Characterization of the network.....	57
Perceptions of risk: Deep concerns for the harmful effects of radiation	59
Information shaping risk perceptions among Long Island Environmental Activists	64
Learning about the risks: Education within the Long Island Activists network.....	66
Factors shaping risk perceptions of Long Island Activists	68
Influencing other peoples’ risk perceptions	69
Creating a climate of distrust and anger between Friends of BNL and Long Island Activists	70
Convergence Network: The Community Working Group.....	73
Chapter 5. Results on Standards and Stigma Across Networks.....	77
Standards.....	77
Understanding where standards come from.....	78
Believing the standards are protective	78
Believing standards are arbitrary, bogus, or inadequate	79
Changing the standards	80
The perception of the standard.....	80
Stigma and its importance in the controversy.....	81
Secrecy and openness at Brookhaven	81
Does tritium have its own stigma?.....	82
Chapter 6. Conclusions	84
Trust as a dimension of risk	84

How social networks shape risk perceptions	86
Standards and stigma in risk perceptions.....	89
Final conclusions	90
Acknowledgement of Support and Disclaimer	91
Bibliography	92
Appendix A. Interview Guide.....	93

Chapter 1. Introduction and Background to the Case Study

Entrée to the Case

In December of 1996 radioactive tritium was detected in the groundwater beneath Brookhaven National Lab (BNL). The news could hardly have come at a worse time for the Lab. A year earlier, BNL had announced a plume of chemical contaminants had migrated off site to the populated area south of the Lab. Drinking water wells in private homes were contaminated with chemical solvents at unsafe levels. Initially BNL and the county health department suspected an industrial park sandwiched between the Lab and the residential area, but subsequent testing proved that most of the contamination came from the Lab.

BNL occupies a site that has been used for governmental purposes for the better part of the last century. Camp Upton was a training ground for soldiers in World War I and was reoccupied during World War II. The Lab suspected that the present chemical pollution originated in times when the base was run by the Army. Nevertheless, it acknowledged responsibility for the contamination and in January of 1996 the DOE offered to hook-up to public water approximately 800 homes in the affected area that were presently relying on private wells for drinking water.

During 1996, while the DOE was paying to hook-up houses to public water, public concerns about BNL's credibility mounted when a second groundwater plume, this one containing ethylene dibromide (EDB), an agricultural pesticide, was found to have migrated off site into a residential area east of the one being hooked-up to public water. These residents also demanded free hook-ups, which the DOE eventually consented to do (about 500 homes).

Although the contamination that led to DOE paying for water hook-ups was of composed of chemicals associated with past uses of the BNL site, people were concerned about radioactive contamination as well. BNL had already admitted to accidental releases of radiation to air and water. Residents were concerned that, if chemicals had migrated off-site, radiation might not be far behind. They were right.

The tritium detected in December 1996 and publicly reported in January 1997 severely aggravated an already-bad situation for the Lab. Tests in early 1997 revealed the tritium was migrating in the same direction as the first chemical plume – right toward the residential neighborhood immediately south of the Lab. Embarking on a massive well-drilling program, BNL followed the plume from its origin at the High Flux Beam Reactor spent fuel pool toward the community. Each week the Lab released results from the newest line of wells. The media dutifully reported each new result. The public saw the extent of the contamination grow week by week. The community waited in fear. After weeks of testing the Lab finally concluded that the tritium had *not* moved off-site and the public was safe. Many other people in the community had reached a different conclusion. BNL had violated the public trust and had been careless in its handling of radiation.

By some measures, BNL and DOE managed these controversies well. They disclosed information as soon as it became available, they invited the public to venues to learn about the

contamination and to ask questions, and they took mitigative measures voluntarily, even before the community could demand it be hooked up to public water. Therefore, the degree of community outrage that resulted came as a surprise to many in the Lab and the DOE.

In the end, the controversy cost DOE and BNL dearly. Associated Universities Incorporated (AUI), who had run the Lab for the DOE since 1947 was fired. BNL went through four directors in the course of a little more than one year. Senator Alfonse D'Amato (R-NY) and Congressman Mike Forbes (R-NY) held hearings with DOE to examine their handling of the affairs on Long Island. There was talk in *The New York Times* of closing down BNL. BNL countered by investing heavily in public relations efforts. They admitted past errors and took responsibility for ameliorating them. They succeeded in finding ways to talk with their opponents. They moved forward with groundwater remediation. And, perhaps most important of all, no major new problems arose.

Today, BNL is able to look back on the experience with minimal discomfort and ask, "What can we learn from this experience?" At present, the Lab has a positive community image. Even many anti-radiation activists in the community concede this. The public may never trust BNL blindly, but the institutions that enable the public and the Lab to communicate are in place. The Lab is widely considered to be a "good neighbor."

Origins of Brookhaven National Laboratory

Brookhaven National Laboratories is located on 5,300 acres in Suffolk County in the center of Long Island, some 75 miles east of Manhattan. The Lab sits atop the sole-source aquifer that serves as the primary water source for all Long Island residents in the region. The soils of Long Island are sandy, which makes aquifer protection an important public issue.

BNL was established by the Department of Energy in 1947 on the original site of Camp Upton, a former U.S. Army base. The facility serves as a major gathering point for scientists from around the world. Its multifarious research endeavors include basic and applied research in the fields of physics, chemistry, materials science, biology, and nuclear medicine. The Lab is proud to announce that no nuclear weapons work has ever occurred at the site, although it has supported other DOE Labs' work in this area.

Three nuclear reactors have existed at the BNL site. The Brookhaven Graphite Research Reactor (BGRR) was the first started in 1950 and it was shut down in 1968. During its operation, the BGRR emitted radiation to air, surface water, and groundwater, leaving a legacy of contamination. The BGRR is now in the final stages of decommissioning and clean-up. The High Flux Beam Reactor (HFBR) is the reactor whose spent fuel pool leaked the tritium. This reactor was shut down for routine maintenance in 1996 just before the tritium was discovered. It was never restarted. In November 1997 DOE Secretary Richardson ordered the reactor closed. There is also a small medical research reactor on the site. The Brookhaven Medical Research Reactor (BMRR) was started in 1959 and it continued to operate throughout the tritium crisis.

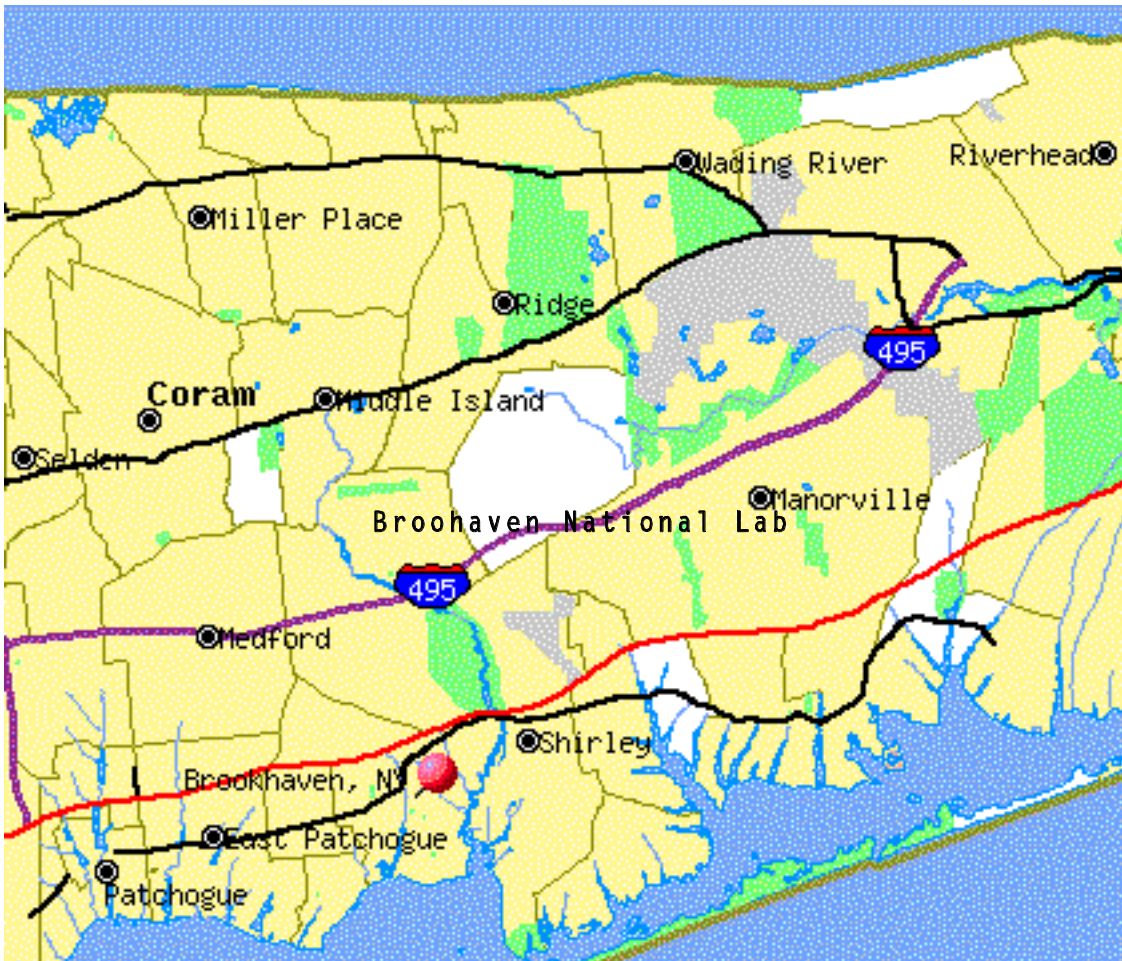
For the first fifty years of its existence, Associated Universities, Inc. (AUI) managed the Lab.¹ AUI's contract was abruptly terminated by the DOE in 1997, just when AUI should have been celebrating its 50th anniversary. What should have been a party atmosphere at the Lab turned into a nightmare. Since 1998 the Lab operations have been contracted out to Brookhaven Science Associates (BSA), a not-for-profit partnership between the Research Foundation of the State University of New York at Stony Brook and Battelle.

To the east of the Lab is the town of Easthampton, where many of New York City's elite own summer cottages and mansions. A handful of prominent people from this community would be instrumental in organizing an activist group that would challenge BNL.

A few miles north of the Lab sits the notorious Shoreham nuclear power station, which was built, but never brought on-line. In what is undeniably the most notable public challenge to commercial nuclear power generation, activists around Shoreham managed to win popular support for dismantling the completed facility, at a terrible cost. The legacy of Shoreham has much to do with what happened in the tritium controversy in 1997.

Just a few miles northwest of the Lab lies the State University of New York at Stony Brook, a prestigious academic institution. Its president until 1994, John Marburger, played influential roles in mediating controversies in the region, and later took over the management at BNL, seeing the tritium controversy through its resolution. Marburger is widely recognized as the person responsible for seeing BNL safely through these challenging times. He has since moved on to Washington D.C. to serve as President Bush's top science advisor.

¹ For a history of the first 25 years of BNL, see Robert Crease (1999).



Map 1-1. Census map of central Long Island with BNL site identified in white in middle of map. Peconic River starts at BNL and flows easterly toward Riverhead. The Shoreham nuclear power station was located just northwest of Wading River.

Precursors to the tritium controversy

Shoreham Nuclear Power Station

Shoreham has been called, “the greatest nonaccident nuclear fiasco of the commercial nuclear power program” (Aron 1997:5). In the late 1960’s the Long Island Lighting Company (LILCO) endeavored to build a nuclear power station on the north shore of Long Island in Brookhaven Township at the location known as Shoreham. Shoreham lies just a few miles from the entrance gate of BNL. The area selected for the plant lie on a beautiful beach in a region of the town where housing values were high. Still, LILCO had good reason to believe the plant would be realized. Support for nuclear power was strong in the country and on Long Island, state and local officials all supported the plant, and LILCO was widely respected by the Long Island public as a sound business and a responsible member of the community.

At the beginning of the licensing procedure in 1968, the only opponents of the station were a small band of activists and the immediate residents of the Shoreham community. As the process dragged on, year after year, hearing after hearing, the opponents saw every one of their challenges to the plant defeated. In 1989 the facility was completed and issued an operating license by the Nuclear Regulatory Commission. However, the license had come at a cost – the loss of public trust. Despite seemingly insurmountable odds, the anti-nuclear activists never ceased their opposition. They scrutinized everything that happened during the planning and construction of the plant. To widespread concern, the planning and construction was fraught with problems. The number and seriousness of the errors discovered was unbelievable. Many of the errors were discovered by the Nuclear Regulatory Commission during its own inspections. In many instances, whole portions of the plant had to be retrofitted or totally demolished and rebuilt. The cost of the plant soared and the timetable was pushed back. Over time, LILCO lost public support, which translated into loss of support from the NY state government. But what really sealed the fate of the facility was the inability of LILCO to produce an acceptable evacuation plan for the region. The challenges of evacuating a densely populated Island were overwhelming. In the end Governor Mario Cuomo decided to oppose the plant and recommended its dismantlement. Although the plant was finished, ready to operate, and obtained an operating license, the NRC, at the request of LILCO, reacted to immense public outrage and political pressure and in 1991 allowed LILCO to begin dismantlement.

Explaining the Shoreham controversy adequately would require examining a myriad of factors, including Three Mile Island, the economics of energy supply and demand, New York State politics, and so on (for a thorough study see Aron 1997). The legacy of the Shoreham controversy with relevance for BNL's tritium controversy includes two major aspects. First, Shoreham produced a group of committed and able anti-nuclear activists. These were individuals from communities immediately surrounding BNL who learned to read technical reports, learned to negotiate public hearing and comment processes, learned how to use the media to get their message out, learned how to amass and mobilize resources (including connections with politicians), and who learned how to influence public opinion. All of these skills would be applied in the BNL case in 1997.

The second legacy of the Shoreham event for BNL came in the area of public relations. The Lab learned not to do what LILCO did. When faced with public outrage and opposition, LILCO responded by closing down the process and limiting, whenever possible, public involvement in the planning, building, overseeing, and licensing the plant. In doing this LILCO enjoyed the support and accommodation of the NRC. Indeed, the NRC's own evaluation of the Shoreham "debacle" (in their eyes) led to the conclusion that public input needed to be further limited (Aron 1997: 130-131).² The effect of such actions was, of course, merely to anger the public further. Although excluding public involvement did enable LILCO to get the plant finished and licensed, it also escalated the political opposition to the point where the Governor himself became involved in stopping the plant. During the Shoreham controversy, John Marburger was the President of the New York State University at Stony Brook, just miles west

² Joan Aron herself takes issue with this conclusion and instead concluded that excluding the public would further aggravate these conflicts. She instead argues for more public involvement.

of Shoreham. He observed the managerial approach LILCO and the NRC took and he observed the effects on the Long Island public. Dr. Marburger, in his new role as Director of BNL, clearly applied the lessons from Shoreham to the controversy over tritium at BNL.

Historical releases of tritium to groundwater

At the east end of the Lab property the Peconic River has its origins. For most of the year the riverbed is dry at its extreme westerly portion, being fed by high groundwater levels only in the springtime. For most of the year, water flow in the riverbed actually begins with the outfall pipe from the BNL sewage treatment plant. And many summers, even this water seeps back into the ground before leaving the site boundary.

Since the High Flux Beam Reactor (HFBR) began operating in 1965, there had been discharges of water contaminated with tritium to the Peconic River via the Lab's sewage treatment facility. Since water in the river mixed with groundwater, the groundwater in that area of the Lab was contaminated with tritium. The level of contamination, for the most part, remained well below the drinking water standard. This contamination was known in the late 1960s. Because effluent from the Lab ends up in the sewage treatment plant, the pollutants to the Peconic River include a wide array of contaminants, including PCBs, heavy metals, and many radionuclides. The river is now Superfund site and the riverbed is to be cleaned up.

Further downstream, where the Peconic River empties into the Greater Peconic Bay (inside the fork at the eastern end of Long Island), anglers pull fish from the river and sportsmen hunt waterfowl. The possibility that the river, and thereby the organisms in the river, were contaminated with radioactive isotopes was a matter of concern to these groups and individuals. One activist from this community, Bill Smith of Fish Unlimited, was a leading voice in controversy with BNL about the contamination of the Peconic River. Bill Smith became a public figure during the controversy over the dewatering of the sewage treatment plant (discussed below).

In 1984 a monitoring well along the Lab's eastern boundary began to show elevated amounts of tritium in groundwater near the Peconic River. Further investigations conducted in 1984 and 1985 found elevated levels of tritium in the effluent from the Lab's sewage treatment plant. Since this effluent is released into the River, groundwater became contaminated. Studies revealed the existence of a groundwater contaminant plume at the eastern border of the BNL site. At the most impacted off-site monitoring well, the tritium concentration had reached 25,000 Pico curies per liter (pCi/l) (the drinking water standard is 20,000 pCi/l). This became known as the eastern tritium plume. Effluent from the sewage treatment plant can reach groundwater through the sand filter beds or by directly recharging along the Peconic River. The source of the tritium was found to be distillate from the evaporation process at the waste concentration facility that was discharged to the sewage treatment plant. To communicate with the public about this contamination, Brookhaven sent William Casey (Manager of Environmental Health and Safety)

and Mona Rowe (Media Relations Officer) door-to-door in communities near the river. Through informal discussions with local people, they informed people of the contamination.³

In addition, the Suffolk County Department of Health Services began sampling private supply wells in an area down-gradient of the contamination and east and southeast of BNL. Their goal was to determine if the contamination had reached private drinking water wells. Tritium was detected in some of the samples, but none of the concentrations in the wells approached the drinking water standard. The highest level found off BNL property was 822 pCu/l, or four percent of the drinking water standard.

Since 1984 the tritium concentration in the effluent from BNL has declined, however, the contamination continues to be an issue for local residents and activists along the river. Residents are also concerned about other contaminants in the river and the superfund clean-up process.

The Tiger Team Investigation

When Admiral James Watkins became Secretary of Energy early in 1989, one of his first acts was to emphasize compliance with OSHA regulations as one of his key agenda items. He inaugurated what are called environment, safety, and health “Tiger Teams” to visit all of DOE’s major facilities. The purpose of the Tiger Teams was to investigate environmental and safety problems at the sites and to ascertain the status of compliance with OSHA regulations. Then he invited OSHA to participate in workplace inspections, which they did at three key facilities. Results from the first three inspections confirmed that DOE’s facilities were substantially out of compliance with OSHA’s requirements.⁴

Brookhaven’s visit from the tiger team came in 1989. This investigation was chiefly responsible for getting BNL placed on the National Priorities List (NPL) or “Superfund list.” BNL became a Superfund site for many reasons, including contamination from the Brookhaven Graphite Research Reactor. At the time of the tiger team, no one knew about the tritiated water leaking from the HFBR spent fuel pool. However, the tiger team did suspect this could be a possibility. One of their recommendations was to have the groundwater near the HFBR tested for possible radioactive contamination. However, work orders to install the wells outside the HFBR were not signed until March 1996, six years after the tiger team’s original recommendation, and the wells were not installed until September 1996.⁵

³ Downloaded August 2001 from: Proposed Plan for Operable Unit V Peconic River/Sewage Treatment Plant (<http://www.bnl.gov/erd/peconic/ou5pptext.html>)

⁴ Downloaded August 2001 from: <http://tis.eh.doe.gov/docs/shc/sc92dec.0007.html>

⁵ Sources used to for this section were: Tiger Teams. *Science* 19 April 1991: 366-368. P.D. Goldis. 1989. Questions and answers about Tiger Teams. *EDPACS, the EDP Audit, Control and Security Newsletter*. Vol. 27, Nr. 4, pp.1-10. (October 1989).

The Tristan Fire

In March of 1994 there was a fire in the HFBR. This became known as the TRISTAN fire after the acronym for the experiment with which the fire was associated. In the experiment, fissile material in a vacuum tube was subjected to neutrons from the reactor. Insulating material caught fire during the experiment and 18 millicuries of radioactive gases were released to the atmosphere. Seven personnel had their clothing and skin contaminated and required decontamination.⁶

Dewatering at the Sewage Treatment Plant

In 1995 the Lab began to pump down the groundwater level at the sewage treatment plant. To install a new facility, the Lab needed to dig foundations and to do this, they first needed to lower groundwater levels.

The problem was that the groundwater being pumped out of the ground was contaminated with tritium. Therefore the Lab was discharging water contaminated with radiation directly into the river. From the very start of operating reactors on the site, tritium had been released into the Peconic via the sewage treatment facility. BNL maintained that the levels of tritium in the effluent were low.

Bill Smith, an environmental activist interested in the river, noticed that, if BNL did follow through with the dewatering regimen, a large amount of tritium would be introduced to the Peconic. There was concern that this radiation might be taken up and bio-concentrated in fish and waterfowl, which local residents and sportsmen consumed. Smith was able to get his word out to the press. Public concerns about BNL's handling of radioactive waste were heightened. Yielding to public pressure, in the end the Lab agreed to stop pumping the groundwater. The sewage treatment plant was eventually completed without pumping down groundwater, but the construction costs were much higher.

Outline of this report

This report discusses the tritium controversy that occurred from 1996-1998 in Suffolk County on Long Island, NY. It recounts the events as they happened and discusses BNL's approach to community relations during the event and the ways that certain people in BNL and the surrounding community formed perceptions of the risk posed by the tritium. The intention of this research was to create an understanding of how sociological considerations influenced individuals' perceptions about a low dose radiation risk. The study focused on individuals in a community that was actively engaged in a risk controversy. Specifically we sought to

⁶ Sources: The type B investigation of the March 31, 1994 fire and contamination at the TRISTAN experiment, high flux beam reactor. (Brookhaven National Laboratory: Upton NY). U.S. Department of Energy Office of Oversight Environment, Safety and Health. Integrated Safety Management Evaluation of the Brookhaven National Laboratory. April 1997. Downloaded from: <http://tis.eh.doe.gov/oversight/reports/evals/9704bnl/9704bnl.html>.

understand how individuals' social situatedness played a role in the way they developed their perceptions of low dose radiation risks.

The following chapter describes the methodology used for case study selection and also outlines the research protocols used in the field research and data analysis. Chapter three provides an in-depth examination of the tritium controversy, situating the event in a broader social and cultural climate. In chapter four three social networks are presented and each examined in sequence: the Friends of BNL Network, the Community Residents Network, and the Long Island Activists Network. For each of these key networks we describe its identity, what perceptions of the risk dominated in the network, how information moved through the network and contributed to risk perceptions, the learning that happened within each network, and how each network interacted with the other two networks. Chapter five presents results on two thematic issues we pursued in the case study: the role of standards and stigma in shaping risk perceptions. Chapter six draws conclusions based on the results presented in chapters four and five.

Chapter 2. Research Design and Methodology Used in the Case Study

Research Design

Our approach to deciphering the complexity of the social environment was to discern distinct social networks within a defined community that experienced a controversy about a low dose radiation risk and then to identify relevant individuals in these different social networks. These individuals were interviewed. Within each network we focused on the following:

- the way information flowed inside this network and between networks,
- the kind of interaction that happened among individuals in the networks that helped people shape their risk perceptions,
- the importance that regulatory standards played in shaping individual risk perceptions, and
- the ability of the term “stigma” to help interpret the formation of individual risk perceptions.

Case Selection

To generate a pool of potential case studies, we scoured the literature for information about radiation controversies at nuclear power stations, nuclear waste management facilities, and Department of Energy laboratories across the United States. We made phone calls, searched the published literature, searched for archival data, and in some cases made site visits to potential case study sites before selecting Brookhaven National Laboratory.⁷

Brookhaven was chosen as the site for this case study based on several key criteria. First, it has a history that includes an intense period of interaction with the surrounding community regarding low dose radiation risk. This period of time (spanning approximately one and a half years) was characterized by a controversy that erupted between this Department of Energy facility and the community surrounding the Lab. Second, this controversy occurred within the recent past making memories of the events readily accessible to individuals who were involved. Third, there were many Brookhaven officials who supported this study by referring us to key community members, allowing us open access to all published documents, and agreeing to allow us to conduct the study at their site. Non-lab employees active in the controversy also indicated a willingness to speak with us about the controversy. Fourth, the interactions that occurred between the Lab and the surrounding community on Long Island were very well documented. The fact that copious quantities of documents, risk communication handouts, meeting agendas,

⁷ Two other sites are also being investigated by other researchers. Seth Tuler of SERI is studying the Health Effects Subcommittee’s work at the Fernald facility in Ohio and Terre Satterfield of the University of British Columbia is studying the perception of low dose risk at the clean-up of the Rocky Flats site in Colorado. These reports should be available on the web site: Decisionresearch.org

and other written materials exist in their original form allowed us direct access to the types of communications that ensued. There were also extensive audio and videotape collections which capture some of the risk communications as well as thousands of pages of newspaper clippings.

Desired participants

We sought to interview approximately twenty people who participated in important ways in the controversy. Our goal was to interview people at the Lab, in the community, and in governmental agencies who played important roles in the controversy. National NGOs would only be included if they had a person assigned to work in the community, or they played a key role in local discussions/dynamics.

Interview Guide

An interview guide was created to structure the interview conversations around the social aspects of risk communication (Appendix A). An interview guide is intended to provide general sets of queries that are asked with approximate wording. It is intended to facilitate a conversation, not necessarily to dictate the precise wording of the questions. There were ten sets of nested questions that were asked in a semi-structured order. Interviews lasted from one to one and three hours in duration. Almost all interviews were conducted with only one respondent and only one researcher present at a time. A few interviews had two respondents and/or two researchers present at a time.

Human Subjects Protection

Interviewees were asked to sign a consent form, which explained the project, guaranteed that their input would be confidential, and explained their rights as human subjects involved in a research project. In this report, all references to statements made by individuals participating in this study to the researchers are considered confidential.

Methodology

Definition of the community

Once we settled upon Brookhaven as a case study site, we sought to delimit the extent of the case. One way we did this was to focus on one main controversy – the tritium that leaked into the groundwater from the spent fuel pool at the high flux beam reactor. We also sought to delimit the geographic and political boundaries of the case study.

Geographically, the BNL site occupies a large area in the central area of eastern Long Island. It is also situated more or less in the middle of Suffolk County and in the middle of Brookhaven Township. Because of its geographical extent and the size of its workforce, what happens at BNL has consequences for the Town of Brookhaven as well as for other neighboring towns. The Suffolk County health department and water authority were both deeply involved in the controversy, which made this a county-wide issue. Despite the broad public interest, most

people involved in the controversy lived in towns closest to the Lab. Towns in the very western part of Suffolk County saw little involvement of their residents.

To the east lies the town of Easthampton, a community where many affluent people from Manhattan maintain summer “cottages.” Celebrities Alec Baldwin and Christie Brinkley from Easthampton became engaged in the tritium controversy at BNL. They and others pooled resources to establish an anti-nuclear activist group, which located itself in downtown Easthampton, about an hour’s drive from Brookhaven National Lab. Thus, although Easthampton lay quite a distance from the Lab, it was home to several people who played important roles in the controversy.

Data Collection and Analysis

Data were collected for this study from on-site visits, formal and informal interviews, document retrieval, and other published sources of information including websites (see Box 2-1). The on-site visits were useful for collecting written materials from Brookhaven as well as becoming familiar with the surrounding environs. Six visits to the case study area were made (see Box 2-2). Most site visits were made by a team of two researchers. While on the site we were given several tours of various parts of the Lab and spent days on site walking around the campus. In addition, we familiarized ourselves with the neighboring communities assessing local governmental structures, socioeconomic factors, services, and environment. A logbook of notes was kept from each visit.

Box 2-1

Sources of Data

- Informal interviews for background information
- Formal interviews with key informants
- Videotapes of public meetings at BNL
- Archived technical reports, meeting minutes, meeting transcripts, newsletters, news clippings, news transcripts

Archival Data Gathered

BNL archived a library of paperwork concerning the tritium controversy. The material is well organized. The media and community-relations department at the Lab maintain notebooks containing:

- Television Transcripts from 1997 (approx 600pp)
- Newspaper clippings from local media in 1997 (700 pp)

- Newspaper clippings from national media in 1997 (1000pp)
- Press releases from BNL 1997 (600 pp)
- Other BNL publications in 1997 (150 pp)
- Information about tritium (700 pp)
- Three notebooks of the Suffolk County Task Force (2000 pp)

In addition, there is a videotape library. All presentations made at Brookhaven were videotaped. Many of these are instructional lectures on radiation, groundwater, etc. One videotape recorded the highly contentious public meeting from January 16, 1996. This was held just days after the DOE announced it would pay for public water hook-ups for people living in the area south of the Lab whose wells were being contaminated with chemicals (not tritium) that leached off-site

Box 2-2

List of site visits to BNL⁸

- | | |
|--------------------------------------|---|
| • November 2000 (Webler and Wilhoit) | Preliminary investigations. |
| • January 2001 (Webler and Wilhoit) | Collect archived materials. |
| Interviews. | |
| • March 2001 (Wilhoit) | Collect archived materials. |
| • April 2001 (Wilhoit) | Collect archived materials. Interviews. |
| • May/June 2001 (Webler and Tuler) | Field interviews. |
| • June 2001 (Webler and Tanguay) | Field interviews |

Interviewees

We conducted both formal and informal interviews on and off site. Some interviewees were chosen based on their level of involvement in specific risk communication events. Others were selected based on their proximity to the Lab. Interviews were generally set up in advance, although a few spontaneous informal interviews were conducted. These spontaneous interviews were not taped but notes were handwritten both during and after the conversations.

We conducted 34 formal interviews, with six individuals interviewed twice. Most formal interviews were tape-recorded. Most of these tapes were transcribed. The tapes were then destroyed. In addition to the tapes, handwritten notes were taken prior to, during, and immediately following the interviews. This allowed us to capture un-taped portions of conversations as well as to reflect immediately upon the interview. Any phone conversations or

⁸ Jasmine Tanguay and Jennifer Wilhoit were graduate student research assistants who assisted with some parts of the field work. Seth Tuler is a researcher at SERI.

email exchanges with potential or actual respondents were also mined for relevant data. The following is a list of individuals interviewed.

BNL Employees

1. William Casey (Former Head of Department of Environment and Safety, BNL) †
2. Robert Crease (Historian, BNL and Professor from SUNY – Stonybrook)
3. Kathy Geiger (Manager, Community Relations, BNL) †
4. William Gunther (Former Head of Department of Environmental Restoration, BNL) †
5. John Marburger (Director of BNL)
6. Mona Rowe (Media Relations, BNL)
7. Ken White (Community Relations, BNL)

Organized Interest Groups

8. **Dick Amper** (Long Island Pine Barrens Association)
9. **Scott Cullen** (STAR) †
10. **Adrienne Esposito** – (CALA – Coalition for Lab Accountability)
11. Peter Maniscalco (Local environmental and peace activist)
12. **Jean Mannhaupt** (Neighbors Expecting Accountability and Remediation) †
13. Judy Pannullo (Long Island Progressive Coalition)
14. Randy Snell (Citizens for Clean Brookhaven)
15. Roger Snyder (Long Island Alliance for Peaceful Alternatives)

Civic Association Leaders

16. Lori Baldisari (President of ABCO - Association of Brookhaven Civic Organizations)
17. **Rita Biss**, (Lake Panamoka Civic Association)
18. **Ron Clipperton** (Former Lab employee and Ridge Civic Association)
19. William Doyle (Bay Area Civic Association)
20. **Don and Liz Garber** (Former BNL employees and Former members of ABCO)
21. **Mike Giacomaro** (East Yaphank Civic Association)
22. Jane Gibbons (Presiding Officer, Lake Panamoka Civic Association)
23. **Joe Gibbons** (Lake Panamoka Civic Association)
24. Helen Guthy (President of the Wading River Civic Association)
25. **Connie Kepert** (President of the Longwood Alliance, Former President of ABCO)

Unaffiliated Citizens from the Affected Area

26. Ron Crofts (Resident of North Shirley) †
27. Rick Stավdall (Resident of North Shirley)
28. Dawn Triche (Resident of North Shirley)

Names in **boldface** indicate the individual was a CAC member as of September 2001.

† indicates that individual was interviewed twice

Data Analysis

The author of this report was responsible for all the analysis of this case study. He reviewed all the field notes, transcripts and tapes (when necessary), and archival literature and videos. The first goal was to reconstruct the emergence and transaction of the controversy.

The next task was to identify core distinguishable networks active during the controversy and to identify each interviewee with one or more networks. Once these were defined, the field data were used to characterize the way that each network influenced individuals' perceptions of the risk.

Following this, he mined all the gathered data to identify data relevant to the central themes: risk perception, role of information, importance of stigma, and water quality standards. These subjects were examined one at a time, for each network in turn. The report represents a depiction of the case and the social networks as understood through the eyes of these twenty-eight interviewees in thirty-four interviews as well as through hundreds of pages of written documents, news clippings, and videos.

Chapter 3. The Tritium Controversy

Unfolding of the tritium controversy

In December of 1996 test results from a groundwater monitoring well located just to the south of the building housing the spent fuel pool for the high flux beam reactor (HFBR) reported a high incidence of tritium. When the contamination was verified in January 1997, BNL quickly notified the public of the contamination. Two things about the event were significant. First, the timing could hardly have come at a worse time for the Lab. The Lab was in the midst of a public relations nightmare due to chemical contamination of private drinking water wells in a residential area just south of the Lab. Second, the monitoring well was itself highly controversial. Community residents and watchdog groups had asked that a monitoring well be sunk at that site as early as 1993. Indeed, the Department of Energy recommended a well there as early as 1989. The Lab had refused, citing other priorities and a certainty that no contamination would be found there.

A simple recap of the chronology of main events reveals the low importance the BNL assigned to investigating whether or not the spent fuel pool might be leaking tritium (see Box 3-1). Starting in 1987 the Suffolk County Board of Health suspected the pool could be leaking when it passed new regulations requiring certain water systems contain double walls, including the spent fuel pool at the HFBR. Brookhaven Lab signed an agreement with Suffolk County in 1987 that it would comply with the new code. However given that the existing tank was filled with spent fuel, it was not a simple matter to empty the tank and replace it. The next warning came in 1990 when the Tiger Team recommended that three to five monitoring wells next to the HFBR would be a good idea. BNL agreed to follow the recommendations, but these wells were assigned low priority and the work orders to install the wells were not signed until six years later in March 1996. It took until September 20th of 1996 for the wells to actually be installed. The first water samples were taken in October, but these were not analyzed until December 1996. The high levels discovered in this first test were suspect, so a second test was ordered. This sample was analyzed much more quickly, with results available in January 1997. Almost ten years had passed since the County had suspected the spent fuel pool was a hazard. It was later estimated that the pool had been leaking for 15 years.

Box 3-1

Timetable of key events associated with monitoring well at the HFBR building.

1987	County Board of Health tells Lab to double line pool and all pipes. Lab agrees to do it, but does not.
1989	Tiger Team recommends lab install monitoring wells near reactor. Lab does not.

1993	Citizens group asks that well be installed. Lab does not.
Sept 1996	Monitoring wells installed
Oct 1996	Initial test sample taken
Dec 1996	Initial results received
Dec 1996	Second sample taken
Jan 1997	Second results received
Jan 1997	Results announced to public

As BNL sought to ascertain the origin and extent of the tritium contamination, they drilled more monitoring wells and conducted more tests. They started at the origin of the plume and worked out from there, drilling more and more wells. In total over 700 monitoring wells were drilled on Lab property. Each time tests found tritium BNL reported the finding to the community. Over the first few months of 1997 to people reading the local papers it appeared that the extent of tritium contamination at BNL was growing daily. As the confirmation about the size of the tritium plume grew, so did public outrage. By mid-spring 1997 the Lab was in a full-blown risk controversy with the communities on Long Island, a conflict the Lab was ill equipped to manage.

Factors that helped propel the tritium controversy to crisis status

As with any public controversy, a number of factors came into confluence and complicated the affairs. It is not possible, even with hindsight, to say which factors were critical and which were ancillary. Instead, we take note of a number of things that came to play an important role in turning the tritium leak into a massive public relations problem for BNL.

The brilliant scientists “goofed up”

Perhaps the greatest contribution to the controversy was the realization that BNL should have known their spent fuel pool was leaking. “We goofed,” said one of the higher-up managers at the Lab. At our first visit to the Lab we asked how BNL could have been oblivious to the leaking of the spent fuel pool. “Didn’t you realize something was wrong when you had to keep adding water to the pool?” we asked. The answer surprised us, as it did many citizens and activists when they first heard this four years ago: “We never measured how much water we had to add.” They expected there would be a need to add water, since there is some evaporation from a large pool of water. So there was a mechanism to add water. But there was no way to check if the expected evaporation rate was matching the rate at which water needed to be added. As it turned out it wasn’t. Once the problem was recognized, the Lab used a laser measuring system to detect small changes in the pool level. This is how they confirmed the pool was leaking.

But what is perhaps even more significant than the realization that BNL did not know the pool was leaking is the realization that some at BNL suspected it was probably leaking, however they did nothing about it. One interviewee recounted a story of a public meeting she attended where she recalled the Lab director at that time, Nick Samios having said, “Well, I’m not surprised that it’s leaking.” In our interview she continued to paraphrase from memory Samios’s statement, “Well, basically, it’s like a big bathtub. It’s a concrete hole with some ceramic tiles, and you know, the concrete got supersaturated and it leaked.” This interviewee was appalled and amazed that the Lab’s director could think such a thing and yet take no action to correct it.

When the word came out to the public that the pool was leaking, that BNL was not surprised about this fact *and yet it had done nothing to correct the problem, despite being urged by certain parties to take action*, the outrage ensued. The response of the woman at the public meeting where the Director at the time, Nick Samios, admitted his suspicion about the leaking pool was typical for many:

I’m thinking, You knew that? Why didn’t you check?!!

To which she added:

Here’s the most brilliant minds in the nation, in the *globe*--forgive me. How could you not notice that 15 gallons per day of highly radioactive water are missing, over 15 years?!! *It was just such a cavalier, lackadaisical attitude about it.* [emphasis in original]

The consequences of BNL’s apparent lack of interest in seeking out environmental contamination worried people and led to a crisis of credibility for BNL. The danger did not lay so much in the tritium itself, but in the uncertainty of what other contamination BNL knew about but wasn’t doing anything to manage. As events unfolded in 1997 and more and more plumes and types of contamination were revealed, this suspicion grew and BNL’s credibility faltered, as this environmental activist reported to us:

I think it led us to believe that it was worse than we thought. Because if they were so casual, and so cavalier about highly radioactive water in a fuel pool--that they should have known and should have been monitoring and apparently did know would probably become supersaturated and leak into the groundwater in a hydrologically sensitive area--then what else are they casual and cavalier about?

Changes in Leadership

One reason this tritium controversy became seminal for Brookhaven’s history, was that it significantly altered the management of the Lab and the focus of research for the Lab. One of the consequences was the firing of Associated Universities Incorporated (AUI), the manager of BNL, just shortly before Brookhaven’s 50th anniversary party. The reasons why DOE fired AUI when it did are unclear and were not investigated for this report.⁹ It remains a point of much tension between the Lab and the DOE, with people at the Lab feeling betrayed by DOE for this surprising trip-up. The point of the matter is that firing the Lab management certainly further

⁹ For a report of the contractor dismissal see: US General Accounting Office. November 1997. Department of Energy. Information on the tritium leak and the contractor dismissal at the Brookhaven National Laboratory. GAO/RCED-98-26 Department of Energy.

damaged BNL's credibility with the community because it confirmed that the Lab had done something wrong.

When Federico Pena took over as Secretary of Energy in 1997, the BNL event was in full swing. DOE staff during this period also changed. At Brookhaven in mid 1997, calls to shut down permanently the HFBR were becoming more frequent. (The reactor had been shut down for routine maintenance, by coincidence, during the early days of the controversy and had not been restarted.) In the summer of 1997 local U.S. Congressperson Michael Forbes as well as New York U.S. Senator Alfonse D'Amato both opposed the restart of the reactor. Later in 1998, Pena was replaced by Richardson. It was Richardson who made the decision to shut down the HFBR.

A culture of "in-your-face" controversy

Another factor many people mentioned as relevant to this study is the culture of direct confrontation that is endemic to Long Island. Many people mentioned that, for better or for worse, Long Islanders have a reputation for being direct (some would say to the point of being rude). Long Islanders even pride themselves at their willingness to speak directly to the issue and to not beat around the bushes. This forthrightness made palatable material for television news and also prevented the controversy from being obscured from the public eye.

Other contamination events

A key factor that accelerated the tritium controversy to the crisis level was that there had been a number of other events that attracted public scrutiny (see below). The tritium became the straw that broke the camel's back in the sense that it was another in a series of events that finally mobilized the community around the Lab to ask questions and to hold the Lab accountable for the answers. The "TRISTAN" fire, the dewatering associated with the upgrade of the Lab's sewage treatment plant, and the chemical contamination (probably historical contamination from the time when the site was an Army base) all produced a heightened state of concern among some that the Lab was acting competently. This in turn led to a higher level of media scrutiny of the Lab.

TRITIUM SPIKE NEAR MEDICAL REACTOR JAN 1997

In January 1997 routine monitoring wells down gradient from BNL's second operating nuclear reactor, this a small 3 MW medical reactor, detected a sudden surge in the tritium concentration of the groundwater. In subsequent months a maximum reading of 10,000 pCi/L was detected. The presence of this small secondary tritium plume was not announced to the public until July 1997 leading some critics to protest BNL's secrecy. A newspaper account of the announcement at a public meeting reported:

Frank J. Crescenzo, deputy group manager for the lab for the U.S. Department of Energy, which owns the lab, said that "we fully intended to tell the public" about the tritium discovery, but "not right away" because it had not been considered "so significant" (Grossman 1997).

In terms of level of contamination, this secondary plume did not apparently add a significant amount of tritium to the groundwater. The real damage of this event came in terms of BNL's credibility. For a good eighteen months BNL had been in the hot seat, learning about the need to communicate quickly and effectively with the public, yet the DOE and the Lab still hesitated in telling the public the bad news. It was just one in a long string of events that served to maintain public outrage about the way BNL managed its reactors.

TRITIUM SPIKE AT SEWAGE TREATMENT PLANT OUTFALL PIPE JULY 1997

On Friday, 27 July 1997 a routine sample taken from the sewage treatment plant outfall pipe was taken. When this sample was analyzed on Monday, it was found to contain tritium at a concentration of 90,000 pCi/L or about 4.5 times the level allowed in the Safe Drinking Water Act. Samples taken on Tuesday revealed levels were again normal. The Lab concluded that a "slug" release had taken place sometime during Thursday and Friday of the previous week. An investigation committee was formed to inquire of all possible sources of the slug.

Complications due to BNL's and DOE's responses to the controversy

Several things that BNL and DOE did helped keep the fire going under the tritium controversy. DOE's decision not to allow Brookhaven to restart the HFBR contributed to a public opinion that BNL was not capable of managing nuclear reactors safely, or that nuclear reactors were simply too dangerous to allow on crowded, traffic-jammed, Long Island.

Another was the way that BNL and DOE initially responded to public outrage and requests for information during the early stages of the controversy. Early attempts to suppress public scrutiny (by discouraging involvement of some activists) and to educate the public (instead of dealing with their concerns) fueled outrage among some interested and affected parties.

Key participants and parties to the tritium controversy

The Suffolk County Task Force (SCTF)

This group was broad in representation, having constituents from the Suffolk County Department of Public Health, Brookhaven personnel, community experts (such as doctors and legislators), as well as concerned community members. The local government had 18 legislators from Suffolk County in addition to the acting executive on this committee. The county is reputed to be responsive to local concerns and progressive. The Task Force did conduct a science study that looked at epidemiology, radiology, and non-radiation contamination issues. They also brought in Brookhaven and Department of Energy employees as well as other officials to testify. One concern some activists raised with the Task Force was that they did not conduct an epidemiological study specifically on Rhabdomyosarcoma, the rare form of cancer being detected in a disproportionate number of

Long Island children. One person said, “it needs to be investigated, [it] raises cause for concern.”

Civic Organizations

Politically, Suffolk County is divided into townships. However, these towns are quite large. Brookhaven town, for example, has about 350,000 residents. Consequently, residents are somewhat remote from town government. Towns are further delineated into villages and hamlets. Some regions of the town fall outside these formal designations, but most of the population of a town lives in a village or a hamlet. These are geographically defined entities with no government themselves. Instead they are used to identify sub-sections of the town. Another political unit that is used is the school district. School districts do not coincide with town or hamlet boundaries, and there can be multiple school districts in one town.

Civic organizations exist in many hamlets of the towns. These are not formal units of governance, but are basically clubs for residents of a certain area. Some “civics,” as they are known, include several hamlets or villages. Any resident is free to join the civic organization. Some charge membership fees and use these to purchase or rent a small building for meeting and office space. The purpose of the civics is to channel public input to the appropriate levels of town or county government. Each civic organization elects a president. The presidents of all the civics in the town of Brookhaven meet together and make up a group known as Associated Brookhaven Civic Organizations (ABCO). ABCO plays an important political role in the town, and BNL stayed in close communication with ABCO throughout the controversy.

Although many of the presentations made by BNL at civic associations were confrontational and challenging for the BNL representatives, for the most part a strong alliance existed between the civics and the Lab. This was particularly true for the civic organizations located to the North and East of the Lab, areas not impacted by tritium or chemical plumes of contaminated groundwater. Moreover, several civic organizations included members or had presidents who were BNL employees or ex-employees. Most important of all, perhaps, was the fact that the leader of the umbrella association for all the civics, ABCO, was an ex-lab physicist named Don Garber. Dr. Garber was a strong advocate of the Lab and he spoke out in many venues including letters to the editor of local newspapers, but also in the bulletin of ABCO, and via press releases from ABCO.

Because the civic organizations were generally deemed to represent a community voice that is independent of the Lab, a certain tension persisted between the civics and the environmental activists. The two groups competed for recognition from the general public. One environmental activist explained how BNL would use the civics to combat the environmentalists.

So they would play the civic activists against the environmentalists. That’s golden for them. The civics made several claims against the environmentalists, claims that carried a great deal of force in the local media. First, they claimed to speak for the local population, and they

accused the environmentalists of being outsiders or representing people from outside the area. This was particularly effective against environmental groups located outside of the region, such as STAR in Easthampton, but other national environmental groups as well. Second, they claimed concern for the economic viability of the region and painted environmentalists as people who didn't care if jobs were lost. Third, they argued that environmentalists, by stirring up the controversy, were devaluing the local housing market, implying that people wouldn't be able to sell their houses if they wanted to move.

Establishment of CALA (Community Activists for Lab Accountability)

CALA, the Community Alliance for Lab Accountability, is a Brookhaven Lab watchdog group comprised of 33 environmental, health and spiritual organizations in the eastern part of Long Island. It arose from a common concern regarding environmental contamination emanating from BNL and serves today as a focal point and primary organization for residents and community groups to get information, recommend policies, and register health, environmental and moral concerns about BNL's operations.

By unifying the positions of diverse groups, CALA has become an environmental, health and ethical organization that is recognized by BNL and the DOE. Its member groups represent more than 50,000 Long Island residents. CALA's mission is to act as an information clearinghouse for member organizations and the public, to initiate community education and outreach, and to establish a direct line of communication with BNL and DOE for the purpose of gaining information and demanding accountability. CALA has demanded environmental representation on BNL's new board of directors, and has established a means of consistent and direct communication between CALA and lab management through monthly meetings. The member organizations work together and separately to develop comments and recommendations on lab operations.

The group was birthed midway in the tritium controversy, in summer 1997. From early 1996 until mid 1997, environmental activists from the area had been attending the Community Working Group (CWG). When the grant destroyed the CWG, some of the activists proposed they meet together to discuss coordinating their actions with regard to the Lab. The early CALA meetings were attended by DOE and BNL officials. They hoped to continue communication with their critics. But the birth of CALA was not easy. Twenty-five activists with different interests and objectives were difficult to weld into one unit. During this process, DOE and BNL was asked to leave. In time, CALA did compose a mission statement, which specified the agenda they hoped to accomplish with regard to BNL.

Birth of STAR

STAR (Standing for Truth Against Radiation) is a Long Island activist group located in Easthampton (more than an hour East of BNL). They formed in 1997 just after the tritium leak was exposed. They were attracted to the issues at Brookhaven, which were, at that time, receiving a large amount of media attention. Although they are not neighbors to the site, their

influence has been significant in part due to the wealth and fame of the Easthampton area. STAR's Board of Directors includes prominent celebrities such as Christie Brinkley and Alec Baldwin. Dr. Helen Caldicott and Dr. Jay Gould have also been instrumental in supporting STAR. Until CALA was formed, STAR was the activist group with the most involvement in Brookhaven issues. With the ebb of the Brookhaven controversies, STAR has taken on a national focus on radiation issues.

STAR has been involved with many activities involving the Brookhaven site. In addition to participating in BNL's meetings, STAR has endeavored to boost community knowledge about the Lab and radiation. Their most significant event on Long Island during this controversy was a workshop they hosted at the State University of NY at Stonybrook.

DOE's and Brookhaven's Risk Communication Efforts

Brookhaven's public relations difficulties were well developed in early 1996 on account of the sewage treatment plant dewatering controversy and the chemical-contaminated groundwater that led the DOE to offer free public water hook-ups south of the Lab. The January 16, 1996 public meeting where the hook-ups were announced was terrible for the Lab. The discovery of tritium in the groundwater twelve months later mushroomed public outrage at the Lab.

To their credit, despite a crisis of leadership both at DOE headquarters in Washington D.C. and at the Lab itself, the Lab moved forward with a variety of risk communication strategies all aimed at establishing communication channels with the local residents and the outspoken critics. It is not the aim of this report to evaluate those efforts. Many scholars of risk communication might applaud these actions. On the other hand, some activists charged the Lab with wanting to placate the public, to discourage inquiry, and to block considered investigation. Employees at the Lab, on the other hand, claim they sought an authentic dialogue with the public where facts and reason prevailed. For the purposes of this research, we only need to note the character of these risk communication efforts.

DOE Oversight of BNL risk communication

One of the key factors shaping the Lab's approach to risk communication was the role that DOE headquarters played. During 1996-1998, DOE underwent a change in leadership from O'Leary to Pena to Richardson. However, for a period of time there was no one at the head of the Department. Consequently, Assistant Secretaries took on responsibility for specific functions. Assistant Secretary Tara O'Toole took charge of the Brookhaven controversy.

O'Toole's approach was to exercise her authority as owner of the Lab and to require the operator (AUI at the time) to submit for her review and approval every public statement or action the Lab proposed to make. Thus, whenever new test results were available, staff at BNL's media relations office would draft a press release, fax this draft to Washington, wait for the Assistant Secretary to review it, edit it, and fax it back to BNL, before the information

could be released. In our interviews with BNL employees we learned that it was not unusual for this process to take three or four days. Some interviewees suggested that the time lag made the Lab look bad, as if it were hiding something, because the Lab was never able to give a direct answer to a direct question. It had to wait for DOE Headquarters to approve every statement.

DOE made the judgment that BNL's public relations office did not have the ability to handle this controversy. In response, it flew in experts from other DOE sites where controversies had been handled. BNL employees recounted (with some chagrin) how these "experts" inevitably went running for the airport after one or two encounters with the Long Island public. The implication among the Lab employees was that DOE staff from other sites simply did not understand the local culture of Long Island and were shocked by the aggressive "in-your-face" attitude of the people.

Much more successful and valuable to BNL staff were the experts in public participation and risk communication brought in to train BNL's employees managing the controversy. Hans Bleiker, James Creighton, and Peter Sandman, three of the biggest names in the field of public controversy all made their appearance at BNL during the controversy. Their advice proved useful and BNL made efforts to act on it. Several approaches to establish communication with the public were taken.

Brookhaven Executive Roundtables (BER)

DOE and BNL established the Brookhaven Executive Roundtables to improve communication among the management dealing with the tritium and the other controversies. They were also meant to improve communication between BNL and the surrounding communities. The BER met about six times between August 1997 and December 1997 and has continued to meet bi-monthly since. The following depiction of the BER was taken from the minutes of the first meeting:

Mr. Helms stressed the importance of the formation of an Executive Committee for BNL. He stated that the principal purpose for the new committee would be to improve communications and to integrate the various activities, to better interact with the various stakeholders, to solicit their input to the greatest extent possible and to diligently seek mechanisms by which we can identify key issues.

The initial membership included DOE and BNL representation along with representatives from Brookhaven Town and Suffolk County governments. The USEPA was also represented, but New York State government was not represented. No activist groups or independent community members were members, although several were allowed to attend meetings as guests. The minutes of the first meeting documented how membership was established by the individuals invited to the first meeting:

attendees were requested to provide lists of the groups they feel should be represented at future meetings. Generally, all members felt the membership was complete.

In other words, the membership of the BER made up of DOE, BNL, and town and county government decided among themselves that no one else needed to be a member of the

organization. This may have served as an important means for a risk communication discourse among government officials and the Lab, but it would not be the venue for a discourse with the public.

The format for the BER was to be open communication in an informal manner. It was decided that the Committee would maintain a rotating chairperson and that neither DOE nor BNL would be eligible.

[Mr. Helms] also stressed that DOE and BNL were members with equal standing as the others and would not impose structure or dictate procedure for the Committee. He further stated that it will be the Committee's duty to responsibly react to issues that are raised by any of the members or the community. Mr. Helms cited environmental safety and addressing citizens' concerns as DOE's priority items for consideration but that the agenda could be as broad as the committee desired. He also stressed that for the committee to be successful, each member would need to commit to be responsive to the concerns of the others.

Roundtables became the vehicle for communication because Brookhaven employees did not want to repeat the kind of adversarial communication with the community that characterized the January 16, 1996 public meeting. Brookhaven often solicited the assistance of outsiders (non Brookhaven employees) to present expert knowledge to the public.

At one of the first few meetings it was decided that future meetings would be open to the public, but only by invitation. People who wished to be invited could contact the Lab. Time would be allowed at the end of such meetings for a question and answer period.

DOE's HFBR Roundtable Workshops

Over the course of September and December of 1997, the DOE held seven roundtable workshops. These were held at BNL and at locations out in the community with the purpose of both educating the public and listening to the public's concerns. Each roundtable originally planned to focus on a different population (see Box 3-2). A list of questions to discuss in each roundtable was prepared by the BNL community relations office. Scheduled to last 3-4 hours, the roundtables were intended to combine different forms of communication. A facilitator or a team of facilitators ran the discussion. The typical schedule included a formal presentation by DOE or BNL followed by a facilitated discussion (anonymous 1997a).

These meetings were advertised by the DOE, not by BNL. They were billed as information sessions. A brochure advertised the meeting as follows: "Learn and Comment! The U.S. Department of Energy is holding an INFORMATION SESSION to discuss the HFBR one-on-one, and accept your input" (DOE 1997a).

Box 3-2**Target audience of HFBR Roundtable meetings**

(listed in chronological sequence)

- #1 BNL senior management
- #2 Regulators and local officials
- #3 Librarians and public information sources
- #4 Environmental organizations
- #5 Civic groups
- #6 Business community
- #7 Activist groups

To ensure that the targeted people knew about and attended the meetings, letters were sent to individual people. These letters billed the event as a “roundtable discussion” and as a “workshop designed to get input from the community” (D’Ascoli 1997). These letters were on BNL stationery labeled “Office of the Director” and were signed by the community relations coordinator at BNL. After the workshop, letters of thanks were sent to people who attended. These letters came from the Brookhaven Group of the DOE and were signed by the Director of the Nuclear Program Division. Appended to this letter of thanks was a list of comments collected from the attendees with a note that the comments were being sent to the Secretary of the DOE in Washington.

BNL prepared carefully for the roundtable meetings. At planning meetings the DOE and BNL participants reviewed who would speak about what and for how long. Presentations were rehearsed and critiqued. The documentation from these meetings emphasized how the meeting should come off to the participants. For instance, one note commented:

We want this meeting to be as flexible as possible, want attendees to have control over how meeting is run – facilitator is there to help them run it “their way.” This requires facilitator to be able to suggest options for managing group discussion, and keeping them on track. Preference is to avoid breaking up into sub-groups (Anonymous 1997a).

One component of several of the roundtable meetings was poster sessions, which are discussed in the following section.

In January 1998, after the roundtables were completed, the Executive Manager of Brookhaven Office of the DOE made a report to Secretary Peña that included the following conclusions:

- There is little widespread opposition to continuing the operation of the HFBR provided it can be demonstrated that it can be operated safely.
- A relatively small number of stakeholders strongly oppose continued operation of the HFBR under any circumstance.

- A far larger number of stakeholders support the continued operation of the HFBR.
- Scientists from academic institutions and businesses worldwide strongly support the continued operation of the HFBR.
- Senator Alfonse D’Amato and Congressman Michael Forbes strongly oppose the operation of the HFBR.

Poster Sessions

Poster sessions were aimed at disseminating information and engendering communication with the public. These sessions were set up with tables designated to specific topics. At each table stood one or more Brookhaven employees. When people approached the table to read the information, Lab employees were available to converse with them and answer any questions. At some early poster sessions, Brookhaven also had tables available for local activists to set up displays with their information, brochures, meeting times, and local events.

As BNL gained more experience and training with community relations, poster sessions became more refined and highly planned. Notes of an “employee session” included the advice listed in Box 3-3.

<p>Box 3-3</p> <p>Advice provided BNL employees at poster sessions</p> <p>Demeanor:</p> <ul style="list-style-type: none"> • smile • be welcoming • face the audience when speaking about your poster • if they have questions you can’t answer write them down and we’ll get back to them • if people appear “lost” engage them in conversation • no gum • don’t be defensive

Another list titled “steps to follow with angry people” included these items:

- do not meet hostility with hostility

- show you are a caring person
- show you are open to hearing their concerns – listen
- project an empathetic nature

Some people were assigned to be greeters, others were to stand by their posters and engage visitors in conversation. Everyone had a name-tag. Media were funneled to the appropriate representative. Everything about this planning document suggests BNL was putting into practice the advice provided by its public relations consultants.

Meetings with civic organizations

One of the most significant things BNL did to communicate their risk messages to the public was to leave the Lab and speak to residents in their own communities. Civic organizations were the natural venue for this kind of outreach. “Civics” are neighborhood groups that meet to discuss problems of governance. Because the Town of Brookhaven is so large, individual neighborhoods find civic organizations a good way to channel their local concerns to town government.

During the period of 1996-1997, BNL employees made dozens of presentations at local civic organizations in Brookhaven and neighboring townships. Meetings were held in firehouses, libraries, schools, and civic group meeting halls. Sometimes the purpose of the meeting was to allow BNL to make a presentation. Other times the Brookhaven employee in attendance would merely field questions.

The dynamics at these meetings varied greatly. Some were highly vocal and contentious. Others were calm and quiet. The most contentious meetings were held in the communities thought to be most impacted by the contamination, those areas to the south of the Lab.

According to people at Brookhaven, there were two reasons why BNL reached out in this way to the civic organizations. First and foremost, the goal was to rebuild trust with the public. They felt that the best way to do this was to first get the public to trust individuals from BNL. As one presenter put it, the goal was to show, “you are a well-meaning person who wouldn’t do bad things intentionally.” Once the public came to see BNL scientists and management as reasonable and “good” people, they would eventually come to trust the Lab again. The second goal of these meetings was to provide the public with “a point of contact.” The BNL employees who made presentations in these venues told people to call them if they had any questions. Again, the purpose of this was to humanize the relationship the public had with the Lab.

Canvassing the Community

Another strategy used by BNL to reach out to local residents was to go door to door in the most affected neighborhoods. A pair of BNL employees, one public relations person and one scientist/manager knocked on doors of houses in the water hook-up areas. They handed out information and offered to answer any questions people might have.

The Rise of the Community Working Group (CWG)

In the early days of the chemical contamination controversy in the first part of 1996 (nearly a year before the tritium was discovered), BNL attempted to establish a Community Working Group (CWG). BNL's goal was to engage the public in a dialogue that would enable the Lab to accomplish a number of things. First, the Lab sought to get its message out to the local residents. The message explained the cause of the contamination, the extent and risk posed, the plan to mitigate the risk, and the changes BNL were making to prevent future contamination. Second, the Lab sought to reduce conflict and build trust with the local population. Several of the civic organizations joined activists in expressing anger, fear, and amazement that BNL could act so imprudently. BNL needed a venue where it could admit its former shortcomings and begin to build a positive relationship with local residents. Third, BNL saw the CWG as an opportunity to test risk communication messages. They would make available to CWG members summary reports and inquire into how the reports were received. Changes could then be made before the final report was issued publicly.

BNL assembled the CWG by telephoning and writing letters of invitation to individuals from the local community who were interested in the events. One member of the North Shirley neighborhood reported that he was invited to attend after making a few telephone calls to the public relations office requesting information. Although BNL invited specific individuals, the CWG membership was open. Anyone could attend. At the first meeting, which was held at BNL, those attending asked BNL employees to leave the room, in order to give the group the space it needed to discuss what it wanted to achieve from these meetings. When BNL was invited back in, the attendees presented a list of fourteen items that the CWG wanted to discuss. For about a year, the CWG seemed to operate fairly well. BNL let those attending direct the focus of the meetings and mainly played an educational role.

The grant that destroyed the CWG

The CWG operated reasonably well until early 1997. Around that time, BNL offered the CWG a grant and office space at the Lab in which to operate. Two main individuals in the CWG, proposed accepting the money and proposed themselves as co-directors of the group. They would receive a modest salary from the grant and take over more leadership responsibilities in the CWG. The money was funneled to these individuals through the Long Island Progressive Coalition, an established non-profit on Long Island that was active in shutting down the Shoreham power plant. A member of the Progressive Coalition had facilitated the early CWG meetings. Two of its lead figures had been active in the CWG from the beginning. The Progressive Coalition formally applied for and received the grant.

Of the people we interviewed who were on the CWG, it was widely acknowledged that the grant destroyed the CWG. People complained about the secretive nature of the grant. We had CWG members from very different perspectives claim that the grant was done "behind the back" of the CWG and pushed through at a meeting that was not widely

attended. They claimed that the Lab would not release the grant proposal or the conditions under which the grant was given. This promoted the notion that the Lab had a secret arrangement with the two individuals who accepted the grant and it raised the suspicion that they were now working for the Lab. One of the more outspoken critics said this of the grant:

When Associated Universities was running that laboratory, they gave a woman, by the name of [names person] a \$50,000 grant to do whatever she was going to do. [...] They give her a \$50,000 grant with no conditions. It's a bribe. It's not a grant, it's a bribe. [...] They wanted to buy a buffer and [names person] was willing to be the buffer. She was going to be the one to present the information to the community, she had environmental credentials, and so she sold out for that money and was going to be their intermediary, their buffer. She was going to answer all the questions that the community had as to what was going on at the laboratory. That what's they wanted, that's what they wanted to buy.

When some members of the CWG objected to what they perceived as Brookhaven taking over the CWG, the CWG splintered, some formed a new organization called the Environmental Advocates. Several members of the CWG joined this informal group, which continued to meet as an advisory body to BNL. But many other activists, especially those who were leading established organizations walked out of the CWG at this time and later formed CALA. At this time several local residents who had participated actively also walked out disgusted and never returned, complaining that everyone (BNL *and* the environmental activists *and* the civic leaders) had their own pet “agendas” and none of them was interested in a reasoned discussion about the facts.

Post-Tritium: The Community Advisory Council (CAC)

After the demise of the CWG, BNL began to study the possibility of setting up a Site Specific Advisory Committee, similar to those at other DOE lab sites. After much consideration of SSAB (Site Specific Advisory Boards) at other DOE sites, and because of the limitations of forming a formal advisory committee, the Lab decided to call the board a Community Advisory Council (CAC). Unlike with CWG, whose membership was open, membership on the CAC is determined by rules. CALA and STAR are represented, as are the civic organizations and a number of other advocacy groups, including groups supporting the Lab. Because the CAC was established after the tritium controversy had largely been played out, it has not been an active participant in that event. The CAC continues to meet bimonthly and deal with ongoing issues between the Lab and the community.

In the years since the controversy, the Community Advisory Council has helped steer BNL toward doing more research in renewable energy. At the same time, the decision was made to also allow the medical research reactor to cease operation. Thus, the tritium controversy was significant in getting BNL to end its relationship with nuclear reactors and to shift at least a portion of its research efforts toward renewable energy sources.

Chapter 4. Findings: The Role of Social Networks in Shaping Risk Perceptions

This chapter reports the results of interviews with Lab employees, community members, and activists. Because the main purpose of the study was to comprehend how people formulate risk perceptions in a social environment, the chapter is organized around key social environments, or social networks. Three distinctly different networks were found in the community studied. Although it may seem so at first glance, the networks are not defined by ideology or even risk perception. We have defined these networks according to channels of communication. Despite this, many (but not all) people in each network may have a similar worldview or even similar beliefs. The point is, simply, that not all members of each network share the same beliefs or perspectives. In describing each network, we consider each of the following: risk perception, conceptual frames, changes in risk perception, information flows, and the connections with the other networks.

A small set of independent community members tapped all three networks, but refused to express any preference for belonging to any one of the three defined networks. These people walked among all three of the networks, seeking information and explanation and intentionally sought to maintain their neutrality and independence. In fact, rather than expressing allegiance to one network over another, they were strongly critical of all three networks for being biased.

For the purposes of this study, we understand a social network to be a pattern of personal connections about a central identifying theme or purpose that a group of individuals shares. Furthermore, we presume that within each network are other networks. For example, within the BNL site, the National Weather Service staffs a small facility. This small group constitutes its own network, yet they were clearly also part of the BNL facility network. The level of analysis invoked in this study, however, makes it impossible to adequately characterize any of these smaller networks. Instead, the focus is reserved for the three broadest networks.

Finally, it is clear that some individuals are capable of spanning networks, becoming members of two or more networks. Three of the people we interviewed had strong associations with both the Friends of BNL network and the Community Residents network. We also interviewed two people who were associated both with the Community Residents network and the Long Island Activists network. We did not find any individuals who identified themselves as being both a member of the Long Island Activist network and the Friends of BNL network.

Friends of BNL Network

Characterization of the network

The core membership of this network includes current and recently retired Lab employees (some of whom are unionized under the International Brotherhood of Electrical Workers Union Local 2230), DOE officials, scientists from other institutions who use the Lab for research (known as “facility-users”), as well as the formal organization called Friends of Brookhaven. Something like 3,200 employees work on the BNL site. Several members of this network were also members of the Community Residents Network discussed below. The

Friends of BNL network is made up of individuals linked through a variety of communicative channels including many face-to-face encounters. Even retired employees often come to the Lab to attend professional presentations or other public events. In addition, a newsletter called *Brookhaven Bulletin* is published by the Public Affairs Office and keeps readers abreast of the Lab's recent doings.

People working at the Lab share many things in common, but workplace is recognized to be a key factor shaping an individual's sense of identity, especially in the United States. All people who worked at BNL shared this identity. They become, in a way, part of a family. One interviewee from the Lab felt uncomfortable with the word "family," but still captured this important idea. Speaking about what it was like in 1997 he said:

[...] that's the atmosphere that generally existed at the laboratory. Because we're all part of the same... not family ... but same group that works on site. Very collegial atmosphere. Friendly atmosphere, amicable.

People working at the Lab also had other important commonalities. For one thing, many of them shared a belief in the importance of verifying knowledge through a scientific process and a belief in the positive nature of science to society. Not everyone in this network is a scientist, it includes employees and other on-site workers from public relations, accounting, construction, security, health care, etc. Still, to be affiliated with BNL is to be affiliated with a belief in science, both as a way of knowing and as a way of improving the quality of life. This case study suggests that a predominant aspect of the ideology of this network is a belief in the positive role that science plays in improving the quality of life. This was especially true for the scientists. One put it in these words:

As an employee at the reactor, we believed in what we were doing, believed in the science, we believed in our contributions.

Interestingly enough, as the controversy developed, BNL would come to be criticized for being too enthusiastic about the science. They were criticized for putting science first, and the environment second, when proper environmental practices should have preceded the science.¹⁰

This belief in the positive value of science is closely linked to a second belief harbored by members of the Friends of BNL network: that the science happening at BNL is of excellent quality. People routinely spoke of BNL is a "world-class laboratory," proudly noting that scientists come from all over the globe to work at the site. One facility user, Jean Jordan-Sweet, linked both of these key concepts (science is good and BNL does good science) when she was quoted publicly as saying:

Our national labs are our nation's treasures! [...] [They] produce patents, contracts, tech-transfer, [and] medical advances, and build up the high-tech know-how of this country. We cannot do strong science without the necessary tools such as BNL's [HFBR]" (High Flux Beam Reactor) (*Brookhaven Bulletin*, Sept 26, 1997 p.2).

¹⁰ This point was first raised in the Tiger Team report a decade earlier (see above).

Perceptions of risk: Human health risks from the tritium in groundwater

We take it for granted that within any network people will hold a wide variety of perceptions of the risk. We do not expect a consensus. However, we also recognize that some networks are defined around an ideology or around a certain experience, as the Friends of BNL network is defined around the experience of working at the Lab and a belief in science. This may be expected to produce a strong agreement on risk perception. Indeed, we found that the institution advanced a specific risk perception. The people from this network who we interviewed indicated that they agreed with this perspective, as we describe below. However, we would not say that everyone in the Friends of BNL network felt the same way about the risk from the tritium.¹¹

For many of our interviewees from the Friends of BNL network, the controversy over tritium in the groundwater under Brookhaven National Lab was strictly about human health risks. Tritium is a carcinogen if it is ingested or breathed in. Contaminated groundwater might be taken up by a private or public drinking water well and consumed by residents in the neighborhood or employees at the Lab.

When we asked interviewees to think back to the early days of the controversy and recount their risk perception, several mentioned concern or apprehension. They felt that this might be a serious health risk, but there was too much missing information to say for sure. They wanted more information. Specifically, they wanted to be sure of the source of the tritium, the amount that had leaked, its location in the groundwater, and they wanted to know about the hydrological conditions of the contaminated aquifer. As these data became available, those interviewees who did acknowledge an initial concern or apprehension about health risks rapidly reached the conclusion that the risks were extremely low. Initial studies done by BNL showed that the contaminated groundwater was not near any drinking water sources, either inside the Lab or outside of it. *Still, this assessment of the risk hinged on the tritium staying where it was thought to be.*

Since groundwater moves, it was possible, reasoned these interviewees, that the tritium-contaminated groundwater could, in the future, pose a risk to human health if it contaminated a drinking water well. The Lab draws its drinking water from wells on site. Just outside the Lab boundary to the west are drinking water wells for the public water supply for local communities. To the south are private wells in the North Shirley residential area. Studies in 1997 showed none of these drinking water wells was in danger of tapping the tritiated water, at least not at that point in time. However, further investigations conducted showed that the tritium plume was moving in the same direction as the chemical plume that contaminated drinking water wells to the south of the Lab. Still, because of the chemical contamination in 1996, DOE had hooked up to public water nearly all the private residences in the danger area south of the Lab. As test wells were drilled and the groundwater model was finalized, the consensus within the Lab community was that the

¹¹ The people we interviewed from the Lab were those most deeply involved in the tritium controversy. Employees in non-science departments (human relations, accounting, maintenance, etc.) might have very different risk perceptions.

tritium would pose no danger to the Lab's drinking water or the public water supply wells. Yet there remained the possibility that it could impact the private wells sometime in the future.

Our interviewees from the Friends of BNL network pointed to three factors that led them to conclude that even this migrating tritium posed no danger to human health. First, tritium naturally decomposes, losing its radioactivity with a half-life of about 12.3 years. Studies showed that, given the slow rate at which the groundwater was moving and the dilution of the tritium in the groundwater, by the time the contaminated water reached the Lab boundary, the level of contamination would be below the standards set in the Safe Drinking Water Act. The conclusion that many people drew was that even if the Lab did nothing, the problem would "fix itself" with time.

Yeah, just leave it alone, and by the time it reaches the boundaries of the lab, the dilution would have taken care of any health issue.

Second, the groundwater models showed that, as the plume migrates southward, toward the ocean, it is also going deeper into the earth. Estimates were that the contaminated plume would be far deeper than any private well was likely to ever be. Therefore, even if the tritium concentration did not decline, and even if people did consume their well water, they would not ingest tritium, simply because the tritiated water was deeper than their wells.

The third reason why the risk to human health from the tritium was perceived by many to be low was the simple fact that the groundwater under the homes in North Shirley was already contaminated with toxic chemicals. The DOE had paid to hook-up to public water everyone with a private well in the danger area. In other words, people were not drinking the water anyway, thus there could be no exposure even if the hazard were present.¹²

Information shaping risk perceptions among the Friends of BNL network

The Friends of BNL network relied on scientific reasoning to make its decisions. Scientific reasoning is a chain of logical associations based on evidence. Therefore, in order to draw conclusions about the risk, individuals in this network needed hard evidence, they needed facts. Two specific sources of information were cited as being key.

The first and most important data were the test results from the test wells that had been drilled across the BNL site. Over 700 test wells were drilled on the BNL site during the course of this controversy. Samples taken from these wells were routinely analyzed for tritium (and other contaminants as well). By monitoring the concentration of tritium in the groundwater at different depths, times, and locations, it was possible to assemble a picture of the danger. People in this network interpreted the data in different ways in order to derive meaning from the numbers. Some physicists we interviewed translated the test results into

¹² As an aside, during our interviews we learned that while nearly all houses did hook-up to public water some kept their well functioning. It is known that at least one family used the well to fill their swimming pool. Thus, it should not be taken for granted that people are not using their wells, just because they got hooked-up to public water.

numbers of atomic disintegrations per second. However, this metric was not widely used. For the most part, people in this network used two different milestones to interpret the significance or dangerousness of the contamination.

The key criterion people in this network used to evaluate the risk was the drinking water standard of 20,000 pCu/l. People routinely talked about concentrations as percentages of this standard (e.g. 25% of the standard, twice the standard, etc.). Although at some wells near the reactor, concentrations of more than fifty times the standard were found, the concentrations generally declined with distance from the reactor. When concentrations became many times the drinking water standard, it was less common to use this metric. Instead, notation apparently switched back to bald numbers of pCu/l (although this is an anecdotal observation and has not been systematically verified).

The second metric commonly used to interpret the dangerousness of the contamination was the amount of tritium in an “EXIT” sign. These signs, which are found in theaters and other buildings, contain tritium gas which emits radiation, striking a phosphorized tube that glows. The benefit of these signs is that they remain illuminated without the aid of electric power, making them useful in the event of emergencies. EXIT signs reportedly contain about 20-25 Curies of radioactive tritium, which can provide illumination for more than ten years. Since EXIT signs are ubiquitous in our society, the implication is that the risk posed by that level of tritium is acceptable. Our interviewees reported the common use of the EXIT sign risk comparison. The total amount of tritium leaked from the HFBR spent fuel pool was characterized by BNL as being less than the amount contained in one EXIT sign.

The EXIT sign also showed up in our interviews in a second way. During 1997, there were two different cases in neighboring New Jersey where teenagers broke EXIT signs and were exposed to tritium. In November a teenager destroyed a sign, exposing himself to the tritium gas. In May, three teenagers ingested some tritiated water from a broken sign while eating sunflower seeds in their home.¹³ The home was tested and urine from the boys and a firefighter was tested (the tests were done at BNL). While it was reported that one of the boy’s urine contained tritium at a concentration of 28,600,000 pCu/l (more than 1000 times the level for drinking water acceptability), the doctors suggested only that the boy drink a lot of water to flush his system. People we interviewed made reference to this prescription. They reasoned, if a boy can be exposed to that much tritium and the doctors are not even worried, why are we fretting about much lower levels in drinking water?

The metrics for comprehending the seriousness of the risk that were privileged in this network clearly depended on the knowledge of the parties speaking to each other. Physicists speaking among themselves might choose to use “number of atomic disintegrations per second,” while engineers speaking to the accounting department might use the EXIT sign metaphor.

The second most important information source to Friends of BNL network was the hydrogeologic model of the contaminated plume. BNL brought in a top-notch team of

¹³ Downloaded from: <http://www.lightpanel.com/tritiumpress.htm>

scientists to characterize and model the plume. Using the best science available at the time and barring no expense, the team produced thick reports and detailed color maps, which characterized the plume in terms of concentration, position, and movement. The major findings of this model (that the plume was moving slowly toward the boundary and deeper into the earth) were substantially responsible for shaping the perceptions of people in this network. The model served to assuage concerns based in uncertainties about the location, velocity, direction, and contamination of the plume. Although the model itself was informed with empirical data (from the monitoring wells in part), such modeling also requires the making of certain assumptions. What assured people in the Friends of BNL Network that these assumptions, the interpretation of the empirical data, and the composition of the model were all made competently was the reputation of the members of the modeling team and the commitment of the Lab and DOE leadership to excellence in the modeling effort.

Risks to Human Health from the Remediation of the Tritium-Contaminated Groundwater

Despite a near consensus among the Friends of BNL network that the tritium in the groundwater posed no immediate or future threat to human health, BNL did agree to remedy the contamination. Two specific actions were taken. First, the Lab pumped about 95,000 gallons of the most contaminated groundwater just adjacent to the spent fuel pool and shipped this water via truck to Oak Ridge National Laboratory in Tennessee for disposal. Many of the same people who told us the tritium posed no risk if it remains where it is also mentioned that there is probably some human health risk from the mitigation measures being taken.

[Removing the tritium] that's really removing no risk. Actually it's creating risk because now you pump it out, you put the employees pumping it out get some exposure, they're receiving some exposure, regardless of how small. And then you have to put it on the highway. You've got a truck trucking it down to Tennessee, so they have vehicular issues, transportation issues take place. And then you get to Tennessee and they evaporate it up into the air anyway.

The second mitigative action BNL took was to install a line of wells to intercept the plume as it moves south. Since 1997 it has been pumping this contaminated groundwater to a recharge basin, where the contaminated water re-enters the aquifer. There are some emissions of tritium to the air in this process at the recharge basin. The logic of this exercise is that, by keeping the tritium contained in this loop of groundwater flow, pumping, and recharge, one prevents contaminated water from migrating closer to the site boundary while the natural disintegration of the unstable tritium progresses. After a certain number of years, the process can be ended with assurance that the radioactivity in the groundwater is acceptable.

One group of special concern at the Lab was a unit of the National Weather Service (NWS) that is occupying a building on BNL land close to the recharge basin. The workers there were concerned about the risk associated with their exposure to tritium that is evaporating off the pond. This concerned them so much that the Environmental Health and Safety Office had to have multiple meetings with those employees to explain why their risk,

while not zero, was very low.¹⁴ To address their persistent concerns, the Lab set up air monitoring stations and provided the current levels to the National Weather Service personnel every day they came on-shift to work. While we were unsuccessful at gaining any interviews with employees of the National Weather Service at BNL, other interviewees suggested that the NWS employees were not as ready as other BNL site-users or employees to accept the tritium risk. A reason why is that, although the exposure levels were probably quite low, the NWS building is adjacent to the recharge basis. In other words, they were more at risk than most other people at BNL to fugitive air emissions of tritium. A second factor is that the NWS personnel were not tightly integrated into the BNL community. They were new to BNL since 1995 and were not necessarily enthusiastic about making the move from their previous location elsewhere on Long Island. Moreover, their building is in a remote portion of the Lab, not a short walk to the cafeteria, which made it difficult for the NWS employees to develop connections with other people on the BNL site.

Learning about the risks: Education within the Friends of BNL network

LEARNING BY LAB EMPLOYEES

During the height of the controversy the Lab began a program of outreach and education for its current employees. For about a month, a team made the rounds of employee departments to speak about the Lab's drinking water, the HFBR reactor and pool, and the groundwater mitigation project. The meetings lasted about one hour, took place at the worksite of the employees, during the employees' paid workday, and were oriented toward answering whatever questions or concerns people had. The people who orchestrated these meetings felt they were very successful.

When asked what made them successful, they reported that employees were given lots of opportunities to ask questions and get answers from the people directly responsible. They also reported that by holding these meetings on the Lab's time they conveyed the notion that the Lab really cared about how they felt. Both those things contributed toward making it a positive experience.

One of the key topics for employees was the drinking water at the Lab. Several employees had noted that people in the Administration Building were supplied with bottled water, while most other buildings had drinking fountains hooked up to Lab water. Some employees were concerned that possibly the Lab's water was contaminated and the administration knew about it. This came as a total surprise to management:

[T]hey [Lab employees] were really concerned about their own health and safety and that...And that really opened up our eyes, like wow, we really do need to communicate better with our own employees about some of these issues. Particularly the drinking water. "Why is there a bottled water in the Director's office and I'm drinking out of a fountain. You know, am I in danger? And why is the Director's office getting bottled water? Shouldn't I?" Just

¹⁴ While we tried many times, we were unsuccessful in getting an interview with anyone at the National Weather Service office near the evaporation pond.

simple things like that. Those are great issues. [...] Almost people instigating that there was a class system. That the higher people were saved and the rest of us got the junk. So it really opened up a number of issues, kind of ancillary to groundwater contamination, the tritium plumes.

While some members in the Friends of BNL network, namely engineers and project managers, needed to base their risk perception on empirical data, we learned that at these employee meetings there was no demand to “see the data.” We asked one interviewee who was central to these educational meetings about the role that information played in helping to shape the employees’ risk perceptions. He answered that, at these meetings for Lab employees, no one ever asked to see the reports:

I can’t even think of a case where somebody [a Lab employee] said, “You’re full of baloney. I don’t believe you.” Or “Prove it.” So, again, I think that was...we were all together. And I think that’s the atmosphere that generally existed at the laboratory

We asked why he felt the employees did not ask to see the actual reports that characterized the risk. His answer was that there was a lot of trust among Lab employees:

I think that there was a certain level of trust and it wasn’t just me...but, a fellow employee, speaking about the laboratory and what was going on.

In summary, within the Friends of BNL network there were people who perceived the tritium risk to be important enough that they raised objections and spoke out about the conditions at the Lab. However, according to those we interviewed, these perceptions were lessened when Lab management listened to employees’ concerns, let them ask questions, and conveyed a sense of collegiality and competence. This is clearly different from encounters that the Lab personnel who were responsible for the remediation had with the community residents (see next section).

These sessions with Lab employees certainly helped employees develop a perception that the risk from the tritium was slight, but they also served a second purpose. During the sessions it became clear that one of the issues facing employees was what to say to their neighbors outside the Lab. Employees indicated a desire to deliver information and messages to their neighbors:

A lot of people did say, “Yeah, oh, okay. You know okay, give me more information. I’d be happy to talk to my neighbors, be a pain in the ass. You know? I’m going to tell them the right things, you know?”

LEARNING ABOUT PUBLIC PARTICIPATION AND PUBLIC & MEDIA RELATIONS

When it became clear to Brookhaven that the crisis was largely about the public lacking trust in them, the Lab set about learning how to better involve the public. They sought out information from a number of sources.

One thing the Lab did was to tap the network of DOE facilities across the country. DOE headquarters helped to bring in experts from other sites which had had public controversies. Staff from these sites visited Brookhaven and made recommendations for how the Lab should cope with the problem.

A second thing that the Lab did was to bring in experts on public controversy. Hans and Annemarie Bleiker, two well-known consultants in the field of public participation in controversial decision making, came to provide BNL Public Relations staff with a mini-version of their week-long workshop. One of the Bleiker's major pieces of advice is to resist the urge to block off participation, and instead to seek out the involvement of concerned people, especially the involvement of the most vocal critics.

Peter Sandman, an internationally known speaker in the area of risk controversies also visited the Lab to deliver a seminar. Sandman emphasizes the difference between cognitive and emotional responses on the part of the public and recommends strategies for dealing with each.

Factors Shaping Risk Perceptions for Friends of BNL network

Based on these interviews we learned that seven main factors seem to be most responsible for explaining how individuals in the Friends of BNL network developed opinions about the risk from the tritium in the groundwater.

Box 4-1

Factors shaping risk perceptions for Friends of BNL network

- Familiarity with radiation and knowledge about its health effects
- Familiarity with scientific terms associated with the contamination (e.g. pCu/liter)
- Confidence in the honesty, integrity, and competence of scientists & Lab management
- Belief that the Lab produces net positive social benefits
- Availability of technical information and groundwater models
- Opportunity to learn about the issue on “company time” with minimal effort
- Tolerance for contamination

First, familiarity with radiation came up as a significant factor. Some of our interviewees from this network had worked with tritium and radiation for decades. For people with this level of experience and familiarity with radiation opinions about the risk of low doses of radiation were probably established years ago and are fairly stable. For example, this individual said,

I don't know. Maybe having been a former Lab employee, I was at the Lab for more than 30 years, maybe I don't worry so much about radiation.

Associated with this is the idea that knowledge of the risk may affect one's perception:

Probably I'm less worried about it because I know more about what radiation is and how it might affect somebody.

And this person attributed her low concern to her professional history:

So my perception of the risk as it existed didn't change a whole lot, partly because of my background: probably 20 years of a technical background.

Second, many, but not all of these individuals were competent in the scientific language used to characterize the risk. By far the most common term used to illustrate the difficulty associated with comprehending this risk was “picocuries per liter” (pCu/l). This is the unit measure used to characterize water polluted with radiation. The Safe Drinking Water Act includes standards for radiation in drinking water, stating that the levels must be below 20,000 pCu/l. Even scientists at the Lab who did not work with radiation, were familiar with prefixes like “pico,” “nano,” and so on. They would also have been familiar with seeing things characterized in terms of large numbers, as this interviewee stated:

If you work in a scientific field, everything is 10 to the minus something or 10 to the plus something. That is no foreign concept to my mind. But to a lot of people it is.

This was not necessarily true for all members of the Friends of BNL Network, but was more applicable to those with backgrounds in sciences.

Third, people tightly linked to the Friends of BNL network had confidence in the honesty, integrity, and competence of their colleagues at the Lab and in other scientific institutions. This made it much easier for those dealing with the controversy to speak with the other employees and users of the Lab. For instance, one person told us a story about communicating with the Lab personnel about the tritium contamination. He noted that, even when personnel were not familiar with radiation and its terminology, they were willing to listen and to believe, mainly because they trusted the integrity of their colleagues.

We started talking picocuries and what the regulatory standards were. Everybody was, “What?!” It was all new to a lot of people, certainly even to the management of the laboratory. So, I think we were all educating everyone at the same time, employees or non-employees. But again, maybe their [Lab personnel's] openness and willing to listen and willingness to trust what we were saying was certainly different [from the public's].

Fourth, people in the Friends of BNL network shared a fundamental belief that the Lab did *good things* for society. Thus, there was a sort of presumption of innocence – the Lab was a good neighbor, a good citizen, and any malicious or bad behavior would have to be proven. Even if they admitted that the Lab occasionally made mistakes, the underlying premise was that the net effect was positive for society. From this standpoint, people were disposed to believing what the Lab said. During the period of this controversy, people at BNL perceived the Lab as “under attack.” The sense of moral rightness combined with this perception of attack from enemies (the media and the environmentalist activists) led to a circling of the wagons mentality, and further strengthened the trust among Lab employees for the Lab and each other.

Fifth, two central pieces of evidence and technical information that the Lab used to characterize the risk were seminal in shaping the risk perceptions of many people in the Friends of BNL network. The first piece of information was the test results from the test wells. Hundreds of test wells were sunk all over the lab property and samples were routinely taken to measure tritium contamination. The second kind of information was the hydrogeologic model

that characterized the tritium plume. The main lesson from this model was that, by the time the plume reached the Lab boundary and entered the area beneath private homes, the tritium contamination in the groundwater would be below the limits allowed in the Safe Drinking Water Act.

Sixth, people at the Lab enjoyed the luxury of learning about the controversy on company time. A team of people made visits to all the worksites at the Lab, giving an educational presentation and entertaining direct questions. Not only were employees paid, essentially, to learn about the contamination, they were also spoon-fed the information. They did not have to make the initiative to go out and get information, the information came directly to them. These meetings were instrumental in shaping the risk perceptions of many Friends of BNL network members. These meetings were one of the key locales where social interaction among the people in this network was focused explicitly on the low dose risk.

Seventh, people in this network, but particularly the scientists see as unavoidable that, in the practice of science, there will be waste products. These contaminants inevitably find their way into the environment, at least at some level. From this perspective, it is infeasible to expect that no waste will escape and it is economically and technically infeasible that waste can be cleaned up entirely. Thus these individuals are likely to entertain a certain tolerance of environmental contamination. The issue is not whether contamination is tolerable or not. Since some contamination is unavoidable, especially at a large lab like BNL, the issue is how much contamination is tolerable. The public, of course, sees this issue quite differently. They equate contamination with mistakes or failure.

The key point to take from this case study is that the Friends of BNL network, through its various channels of written and oral communication, served to nurture and reconfirm these risk perception factors among its members. For example, when the Lab newsletter would include a story about prestigious science happening at the Lab, all the members of that community would have reconfirmed their fundamental belief that the Lab was doing good things for society. And when management of the Lab would speak about radiation as a routine matter with which the competent and experienced employees at the Lab were accustomed to dealing, the employees would have reconfirmed their notion that radiation was a familiar entity that could be handled routinely in a safe manner. In numerous communicative channels throughout this network, all of these risk perception factors were confirmed and renewed.

Community Residents Network

Characterization of the network

The core of the Community Residents Network is the membership of the civic organizations in Brookhaven Township. BNL is located pretty much in the middle of Brookhaven Township, a town with several hundred thousand residents. Because the community is quite large, town government is somewhat remote from its citizens. Many residents in the town live in small villages, known locally as hamlets. These hamlets can have their own post offices, their own schools, their own water suppliers, and so on, but they have no governing capacity because all the governing is done at the level of the township. Civic organizations were

set up to provide hamlets a means for democratic expression. They offer local residents a place to turn when local problems arise. The civic organization then takes these concerns to town government.

About a score of civic organizations exist in Brookhaven Township. A typical “civic” will have a small building where meetings are held and a membership of 100 or more. Members pay dues and elect a president. In addition to local civics, there is a mother organization known as ABCO (Associated Brookhaven Civic Organizations) whose membership consists of the presidents of the local civics. ABCO also elects a president, a person who thus gains a great deal of prominence in township affairs. ABCO publishes a newsletter called the *Civic Sentinel*, which keeps the civics abreast of local political event. During the tritium controversy, the *Civic Sentinel* printed numerous articles with regard to the Lab and the controversy.

Although it would certainly be incorrect to depict people in civic organizations as uniform, it is reasonable to suspect that there will be similarities among them, as this interviewee claimed:

I think people feel comfortable with people that have the same beliefs as they do, and not just on that subject, ... in general. To be a civic volunteer I guess, that draws a certain kind of person. It's a lot of work and you have to kind of have a passion for it. That's why our core group has developed that way, because we all have our own little passion.

The civic organizations have a strong interest in local business, but they are also interested in protecting the health of the local residents and the quality of the local environment. Because of this the civics often positioned themselves as being between the Lab and the activists. On the one hand the civics were interested in seeing the Lab stay in business. BNL employs something near 3,200 people, so the economic health of the region is tightly coupled to the Lab. On the other hand, if the Lab contaminated the community, housing values would decline, quality of life would suffer, and the community might even become stigmatized as a contaminated place. Thus, the civics had a strong interest in seeing the Lab survive, but also ensuring that the Lab operated responsibly.

Only a very small percentage of the town population belongs to a civic organization. The Community Residents network also includes people living near the Lab who did not attend meetings of local civic organizations. These people may be active in community affairs in other ways (e.g. school board, local library, clubs, etc.). People living in the North Shirley neighborhood directly south of the Lab and people in the Manorville area near the southeast corner of the Lab were commonly seen as the most directly impacted (they live in the zones where DOE agreed to pay to hook up their homes to public water). These residents were motivated to learn more about the tritium risk by a concern to protect their health and their property.

Just as there were many networks within the Friends of BNL network, there are many networks within the Community Residents network. ABCO would be one example of this. One interview who attended some ABCO meetings remarked about how people in ABCO have come to depend upon each other and still they tend to approach the issue from a similar perspective:

I guess we've created, with this affiliated civic organization a core group of people who have varying degrees of expertise in different things. I guess we depend on each other to say, "Hey! Did you read that?" And, "What did you think?" You definitely can't stay on top of every issue--it's impossible--and be really in tune with what's happening. There's so much conflicting information. But I think we've built this core group that's really, we rely on each other. It's helpful, because you don't have to be an expert on everything. And yet, you know that, that there's some, you can depend on these people, because they're looking at things from a point of view that's similar to yours.

Perceptions of risk: Links to organizational practices

Community residents not affiliated with the lab who we interviewed reported that, at first they were concerned about the tritium contamination, however people had different reasons for being concerned. One person remarked that the novelty of tritium was frightening:

At the beginning it was very frightening. You don't know anything about tritium.

Another person remarked that he perceived the risk as high because the concentrations of tritium in some well samples were well above the drinking water standard:

Because some of the concentrations in the center [of the plume] were very high: 750,000 pico-Curies [per liter]. I mean they were *very* high.

A couple of people both mentioned they were initially concerned that the tritium plume seemed to be moving toward drinking water wells, thus it seemed possible that the problem could get a lot worse.

Still, what is interesting is that the risk perceptions of people in this network included evaluations of the performance and credibility of the laboratory. When we asked people to tell us what their perception of the risk was at the present moment, they frequently responded by talking about the competence or credibility of the Lab. This respondent's answer to our query about her perception of the tritium risk is exemplary:

I guess... well... I have one question that I wrote down. Why didn't they discover the leak sooner than they did? Because you can't tell me that if you're losing water out of the storage tank, constantly, you could figure out what the radi..not the radia...uh, what the evaporation should be. And I think that it was well over the evaporation rate.

In hindsight, most people with whom we spoke in both the Friends of BNL network and the Community Residents network came to the conclusion that the tritium controversy was primarily a controversy about loss of trust and confidence in the Lab, not a crisis of public health. And it is with the community residents that the Lab lost trust. Certainly the Lab never enjoyed the trust of the Long Island activist community. Perhaps *trust* is not even the right word. And perhaps the local residents did not *not trust* the Lab so much as they were willing to ignore the Lab and leave it alone. Whether or not this should be interpreted as a vote of confidence that the Lab was acting responsibly is impossible to say based on the data gathered in this study.

One interviewee from this network posed an interesting hypothesis. She was commenting on how BNL had remained a secret, since opening in 1947. No one knew what was

going on there. As long as nothing bad happened, people ignored the Lab. But when radiation leaked or media reported other controversial information about the lab, concerns would rise. She concluded that distrust emerges from fear, and that fear emerges from a lack of knowledge. In other words:

Lack of knowledge → fear → distrust

By not engaging the local community, BNL produced the condition that the local population lacked knowledge about the Lab. Then, when the media or activist groups made assertions about dangerous conditions at the Lab, the public became fearful. When the Lab failed to address those fears in an expedient manner, or when the Lab failed to inform the local population about what was happening at the Lab, the public quickly became distrustful of the Lab. This distrust was certainly accentuated when DOE punished the Lab by firing AUI for incompetence.

What is known is that the members of the Community Residents network that we interviewed were angry about the Lab's poor performance. When we asked about their perception of risk from the tritium, people talked about the poor behavior of the Lab. This person uses the Lab's own boisterous claims that it is a "world-class facility" to express his utter disappointment with the Lab's environmental protection record:

I think what was disappointing was that such a prestigious, world-class research institute could allow such a thing to happen. That's where they lost public support. "World-class" nuclear research facility, measuring a tritium pool with stick rulers and floating things! I mean, that was where I think the really lost *a lot* of their credibility, was the fact that they did come out after so many years and they either didn't admit it, or they couldn't tell.

One person likened BNL's pollution of the aquifer to aiming a shotgun at the community, explaining that, like groundwater, shotgun pellets spread out, there is not a narrow line of fire. The tritium pollution was equivalent to an attack on the community, which displayed a lack of caring on the part of BNL:

And I kind of felt like this was a shotgun on us. The BNL was here and they could reach us. And there could be some potential problems. Or at least address it, you know? If you're gonna fire a shotgun, let me know about it. I'll stand back here until you get done. But this was just uncaring from my way of thinking about it.

This last quotation introduces the idea of maliciousness. It suggests that this respondent might be implying the Lab intentionally meant to create harm. This a sentiment was not unheard of in our interviews, but it was uncommon to hear it among people in this network. For the most part, community residents seem to have felt a combination of incredulousness / disappointment (I can't believe they let this happen!) and anger (don't they care enough about us to do things right up there?!).

It is interesting to examine these findings in the context of an article on trust in risk controversies (Kasperson, Golding, Tuler 1986). Kasperson et al. concluded that trust contains four components: caring, commitment, competence, and prediction. In other words, people are likely to trust organizations when they perceive the organization as exhibiting these four characteristics. These data echo two of these features. They show that people

perceived the Lab as uncaring (aiming a shotgun at them) and as incompetent (failing to notice that gallons and gallons of radioactive water had been leaking for 15 years!).

In the end, many community residents who entered the controversy cautious of the risk ended up, years later, concluding the risk to human health was slight. The following exchange occurred with a community resident in the impacted area:

I am well-known as an environmentalist but I just didn't see this as a threat either to, quote "to the environment" or to health and safety, of the nearby residents.

Another exchange with a different person conveys the same message, but it also reflects a learning process the person went through:

Q. What's your opinion on how dangerous the tritium is now?

A. I don't think it's nearly as dangerous as the media hyped it to be. I think that if you believe what the Lab says, it's extremely low-dose. You know once again as I told you on the phone, I think that the other issue is much more toxic, that was the VOC issue, the solvents in the groundwater. Tritium. I just don't think that tritium is that bad, quite frankly.

Q. Did you think that at the beginning?

A. Yeah, I think they helped me make up an opinion on that, based on the fact that tritium is naturally available.

It is interesting to note that the individual qualifies his remarks with "if you believe that the Lab says." This points to the point raised above for this network. People were not willing to separate a discussion about the risks of the tritium from a discussion about the credibility and consideration of the Lab. Another community resident we spoke with said almost the exact same thing.

Q. What's your opinion on how dangerous the tritium is now?

A. Well, if you believe the data, then the tritium is not a concern.

We asked if this person believed the data. The response was that he "tentatively" believed the data, but was ready to disregard this belief at any sign of data that suggested the opposite was true. Clearly, the issue of trust lies just below the surface.

We conclude that, presuming that the individuals we interviewed are typical of many other community residents, the residents are willing to trust the Lab and their characterization of the risk, but this trust is conditional on the Lab maintaining the openness, honesty, caring, and commitment from top leadership to sound environmental practices. At the first sign of another mistake or the first sign that the Lab is clamming up, lying, or misrepresenting something, the residents will withdraw their trust and their perceptions of the risks will increase in importance.

Learning about the risks: Education within the Community Residents network

The people we interviewed from the Community Residents network explained that they put a lot of effort into learning about tritium and the contamination. All of them stated

that they did this with out of a sense of need, rather than preference. All said they had other things they'd rather be doing, but they felt obliged to get involved in this issue.

This sense of obligation arose in two ways. For people living in the areas south of the Lab—the water hook-up zones—people felt obliged to get educated out of a need to protect their own interests. One person replied that he became involved after noticing a crew drilling a well out behind his house. He asked what they were doing and they told him, “drilling a test well,” but they would not tell him what they were testing for.

They are drilling to find something. I wondered what they are looking for? That's what motivated me to investigate.

Up until this point residents had assumed the Lab was operating responsibly. But when it became obvious that the Lab had been remiss—at least in failing to notice tritiated water was leaking from a storage pool—they felt a need to step in and protect themselves.

Another person remarked that she decided to educate herself on the issue after she found it difficult to find a reliable source of information. She realized that she would need to rely upon herself:

Well, see I had great fears at first that, after I was lied to a couple of times, unless I taught myself how to understand this stuff, I would never really know the difference of whether or not I was being lied to.

It is interesting to note that they did not trust the overseer of the Lab (DOE) to step in and protect their interests, nor did they readily put their trust in EPA or NY State government, nor did they trust the Suffolk County government to protect them, nor the town government. This loss of trust in BNL was accentuated by a loss of trust for all other levels of government, at least in the immediate term. As time passed, community residents did come to trust the state and county government, although it was clear that neither of these had but very limited ability to influence what the Lab did. Instead, people relied on these other levels of government to provide water quality testing and epidemiological studies, information that would help the residents verify the Lab's data and information that would help the Lab make decisions about how to manage the contamination.

The second way that members of the Community Residents network developed a sense of obligation to become educated and involved in this controversy arose out of a personal sense of community responsibility. This held mainly for people active in civic organizations, especially those outside the hook-up area. The presidents of civic associations to the North and West of the Lab became involved because their members expected them to be knowledgeable about the issue. Clearly BNL was an important part of civic life for the whole region of Long Island and the civic associations wanted to be abreast of the happenings there.

People in the civic organizations were galvanized to interest in the BNL controversy by dramatic newspaper and media stories. However, few people said they turned to the media for information. In fact, one of the things that our interviewees reported changing over the course of this project was their view toward the media's portrayal of the controversy:

When you hear all that stuff, or reading the paper, and we tend not to believe the papers anymore. I used to, but I don't anymore.

People reported that the media exaggerated stories for sensationalist purposes, that the media were used by the different parties for political ends, and that they simply often “got it wrong.” In other words, after a few months of educating themselves, these community residents were more knowledgeable than were the reporters about what was happening at the Lab. They no longer saw the media as an important information source.

To educate themselves, community residents turned to a variety of different sources. In contradistinction to the Long Island Activist network, community residents did not reject the Lab's information out of hand. The level of suspicion among community residents toward the Lab did vary a great deal, but all the people we interviewed from this network felt that the Lab had information that was essential. People who basically trusted the Lab, and this mainly included people living outside the hook-up area to the south and east, accepted the Lab's information at face value. Those more directly impacted sought to confirm the Lab's information with other sources.

Anything they [the Lab] said, I would ask for documentation, use the Freedom of Information Act and get my own research.

In 1997 the internet was not as pronounced as it is today. People relied on the library for information:

I think only once, we went to the library [to] research some of those things. ...[W]ell we were going there actually to find out what picocuries meant and things like that, because nobody over there told us, you know, the millionths of a curie or anything like that. We had to figure that out ourselves.

Other key sources for information for community residents came from the Suffolk County Task Force (see above) and the Suffolk County Board of Health, which did water quality testing for the Lab. The NY State Department of Environmental Protection and the US EPA also performed water quality testing, and at the request of community residents, blind samples were taken to demonstrate that no one was intentionally manipulating the results.

Several people mentioned the importance of a DOE report—the Tiger Team report from the late 1980s. As mentioned in Chapter 3, the DOE dispatched assessment teams to each Lab. The BNL team produced a report that contained a recommendation to install monitoring wells near the HFBR. Community residents cited this as a very important piece of information. However significant this may have been, even more important was another vignette extracted from this report. Lab scientists who were interviewed by the Tiger Team were quoted in the report as saying that safety was a hindrance to science. To the community residents who told us about this, it indicated that Lab personnel cared less about the health and welfare of the surrounding community than they did for the science they were doing. This conclusion was further confirmed when the residents brought this report to light in a meeting with BNL. “They [BNL] hated us for finding that report,” said one community resident. When we asked how they knew, we were told it had to do with the surprised and angry response from BNL representatives

at the meeting. Statements like, “Where did you get that?” and “How did you get that report” signaled to the residents that they were onto something the Lab did not want them to know.

While some community residents did spend evenings and weekends pouring over technical reports and data, people attributed a great deal of importance to attending meetings and presentations. While not everyone would agree with this person that reading was not important, they would probably agree with the sentiment expressed, that meeting and talking among themselves was *essential* to reaching informed judgments.

When people read things, they ignore it. But when they hear people talk, then it affects them.

All the people from this network that we interviewed had attended presentations at the Lab. Sometimes the Lab came to the civics to make presentations. The county officials from SCTF and Department of Public Health made presentations. Presentations and workshops were also arranged by STAR. At these venues, residents often had one-on-one encounters with specific individuals. Some reported that these were much more important in shaping their perception of the risk than were formal presentations or thick technical reports. The civic organizations in Brookhaven, and especially the ABCO organization, relied heavily on an ex-Lab employee and physicist for knowledge and interpretation. This individual argued strongly in the Lab’s favor and frequently made himself available for civic organization meetings. Not everyone in the community residents network was willing to accept this individual’s point of view, however, some residents criticized the civics for listening too much to him.

One interviewee relied heavily on a personal relationship she had with a technical expert outside of the region. The connection was brought about by coincidence and, via mail and telephone calls, a relationship was built that ended up being very instrumental to this person’s education.

But by far, the single most important venue for self-education was the interaction that happened at the Community Working Group. Because the CWG included involvement by people from the other two networks, it is discussed below. Still, the CWG was initially established by the Lab for the purpose of engaging the community in the issue.

Confidence in being able to learn about a technically complex issue is an important factor in explaining why some people went to these efforts while others did not. We only interviewed one resident of the hook-up area who did not participate in any way in the controversy, and she reported a lack of self-confidence in being able to learn about the topic. She had no formal training in sciences and felt intimidated by the complexity of the issue. Instead, she chose to ignore the whole thing, while expressing anger and distrust at the DOE and at BNL.

We inquired of our interviewees whether they felt it is necessary to be a scientist or have a training in some science-related field to become involved in educating oneself about the controversy. Not only was the material technically challenging, but there was a need to understand the way that scientists think. Most agreed that having a science background – even if it is in an unrelated topic – certainly is an advantage, especially if you want to be able to ask tough questions:

You can’t ask a tough question unless you know what’s truly going on.

Those community residents who did get involved, often wished more of their neighbors were involved as well. Some people expressed frustration at their neighbors. One person recounted, sadly that the largest community meeting turnout what when a law firm held a community meeting to get people to sign onto a class action law suit against the Lab. He went on to say that community residents who did show up to meetings faded fast, because, in his analysis, they were only looking for someone to blame. “No, the Lab didn’t cause your cancer, you only moved here two years ago!” he said to one person.

Factors Shaping Risk Perceptions for Community Residents Network

Based on these interviews we learned that several factors seem to be most responsible for explaining how individuals in the Community Residents Network developed opinions about the risk from the tritium in the groundwater.

Box 4-2

Factors shaping risk perceptions for Community Residents Network

- Familiarity with the Lab and personal relationships with individuals in Lab and DOE
- Sense of commitment by Lab leadership to be open and do the clean-up right.
- A jury mentality where they listen to information and arguments made by the two arch-enemies: the Activists and the Lab.
- Personal ability to understand technical information.
- Verifying the data given by the Lab.

First, residents reported the importance of breaking down the barriers of secrecy surrounding the Lab. With those barriers in place, perceptions of the risk were high because fear was high. They recognized a need to arrive at a better understanding of the Lab. Toward this end, they emphasized developing personal relationships with leadership at the Lab and the DOE. As people came to trust these individuals, they came also the trust the institutions for which these individuals worked and the risk messages they were delivering.

I knew [names person] when he was in charge of a certain portion of the clean-up. So I got to know him. Now he’s in charge of DOE over there. And you get to know people like [names another] and others. So, I trust them. I mean when we have discussions, they don’t sound like they’re trying to put anything over on anybody.

Second, residents scrutinized the Lab’s leadership, looking for signs that the Lab was not only taking this situation seriously, but that they had a reasonable and competent

approach to dealing with the contamination. When residents felt the Lab leadership was arrogant or careless, they reported higher concerns for the tritium risks. But as Marburger became settled in the position as Lab director, residents reported feeling much less concern about the risk. This was mainly because to the Community Residents Network Marburger seemed authentically interested in the Lab changing and in getting the Lab to fix the problem in a way that would regain public credibility. People remarked that Marburger treated everyone with respect, that he seemed interested in hearing what all people had to say.

Third, the community network saw itself more or less as a jury who listened to the Lab and the Activists make their respective cases. The open antagonism between the Lab and the Activists gave the Community Residents the space they needed to feel neutral. They could be comfortable in their neutrality, knowing there were gadfly activists overseeing the Lab and able Lab leadership making the case for the Lab. Members of the Community Residents Network did not just sit back and wait for the show to begin. They also initiated their own investigations and engaged in dialogue with each side before reaching a tentative position. The position is tentative, because it is subject to present understandings and present levels of trust in the Lab, which they now view as a fluid variable, not set in stone. These quotes from people in this network illustrate these points well:

You have to listen to both sides. I mean you can't just take one side or the other.

Well, I listened to both sides because I knew the people who wanted the lab shut down had reasons for it and I wanted to find out what their reasons were. Not just because it was a DOE laboratory sitting there, but because the lab might be harmful for the environment or the surrounding areas. That was one of the main reasons that I listened to both sides. I still listen to both sides.

Fourth, although most members of the Community Residents Network who participated in regular meetings with BNL were trained in engineering or the sciences, most community residents probably did not have the expertise needed to interpret and critique technical analyses. Even those who were trained in a scientific discipline often felt limited in their ability to comprehend the technical information, as this individual expressed in an interview:

Now, there are things you have to take for granted that...as just a citizen, I know nothing. I am not a scientist and I know nothing about that ... I knew nothing when I first started, I didn't even know what tritium was when I went over there. ...and for me to say that 20 different scientists are wrong [...] would be ludicrous. I'd be stupid to say that because I don't know. I have no idea.

This quote comes from a person who worked as an engineer (not at the Lab) and who mentioned that he was often called upon by his peers to interpret technical reports. Despite this limitation, the members of the Community Residents network that we interviewed emphasized the importance of seeing the technical information and reports. Unlike people in the Friends of BNL Network whose engineering and physics background predisposed them to accepting risks, there was less consistency among the people in the Community Residents Network. Some were more like BNL employees, comfortable with ideas of radiation and contamination management because they had professional experience in these areas (although not at the Lab). Others who

had similar technical backgrounds took more critical stances toward the Lab and sought to validate the Lab's assertions through independent data.

Fifth, people in this network certainly did not trust BNL blindly. They came to trust the Lab with time, but at first they sought to verify information they received from the Lab. Because the residents did not have the technical expertise they needed to discuss technical issues with the Lab, they relied on verification of data by other governmental agencies. Unlike the Long Island Activist network, which produced its own understandings based on independent information, people in the Community Residents network primarily relied on information and interpretations of information from the Lab, but they had key portions of this information validated by outside parties.

Relationships with other networks

RELATIONSHIP BETWEEN THE COMMUNITY RESIDENTS NETWORK AND FRIENDS OF BNL NETWORK

At the start of the controversy, many members of the Community Residents network were disappointed, angry, and even suspicious of the Lab. Until the mid-1990s the Lab was probably seen as an asset to the community. People were proud of having a “world-class laboratory” in their community. This shifted as the community learned about one source of contamination, then another, then another, until finally the radioactive tritium plume was announced in 1997. Even pro-business civic association members began to ask themselves, “What the heck is going on up there [at the Lab]?” For a while it appeared as if the Lab could do nothing right.

As far back as 1993, community residents had asked BNL to sink monitoring wells just to the south of the High Flux Beam Reactor (HFBR) to test for possible radiation contamination of groundwater.

We had requested (name removed) and a few of the others had requested that they install observation wells just south of that reactor. And they, I don't know whether they...I don't know whether they outrightly refused, or they said they were unnecessary at that time, and they didn't put them in. And that was in 1993.

And even earlier than that, in 1989 the Suffolk County Health Department had asked BNL to double-line the spend fuel pool, just to protect the aquifer in the case of a leak. The protective liner was never installed and the monitoring wells were not installed until October 1996. Monitoring wells were installed all over the Lab, but the Lab did not sink one near the reactor, where the citizens had specifically asked one be sunk. This led one civic leader to ponder the reasons why:

They put up 700 monitoring wells all over the place, but they didn't put one *there* [in front of the HFBR]? Am I *stupid*? Am I reading something into it and it's not there or is there really something there?

Whatever the reason, it was not going to look good for BNL, he concluded:

It was either stupidity or lack of caring that they didn't put the wells in.

The frustration civic leaders felt toward BNL for failing to detect the contamination—even after they told BNL where to look for it!—produced a great deal of frustration among civic leaders:

Well. At the beginning I was concerned about the tritium leak. I was concerned and I was a little bit angry because we had asked the lab to sink wells around the reactor. And I had actually thought that that had happened. But we [the civic organizations] found out that they decided to sink the wells only on certain occasions around the reactor, and not, you know, not everywhere. So they didn't find the tritium plume until very late. So there was a little bit of anger there and sort of disenfranchisement with the BNL itself, that they really didn't take the recommendations of both the community and the Suffolk county health department and do what they really should have around the tritium, around the nuclear reactor. So, certainly, we [the civic organizations] were angry at them.

This frustration and disappointment that community residents felt toward the Lab peaked in the first half of 1997. After that, BNL succeeded in regaining trust and confidence of the community residents. Every member of the Community Resident network that we interviewed remarked that, at present, they feel satisfied that the Lab is acting responsibly and they recognize the Lab as a credible source of information. The Lab succeeded in turning around public opinion, at least among the community residents network through extensive public outreach. The only caveat to add is that the Lab is basically on probation with the local residents. As long as it continues to be well-behaved, the residents will continue to rate it as a good neighbor. But at the first sign of any secrecy or untruthfulness, the residents will certainly withdraw trust again.

RELATIONSHIP BETWEEN COMMUNITY RESIDENTS NETWORK AND THE LONG ISLAND ENVIRONMENTAL ACTIVISTS NETWORK:

As the relationship between the Community Residents network and the Friends of BNL network improved over the course of the controversy, the relationship with the Long Island Activists network remained strained.

Many interviewees from the Community Residents network denigrated the activists involved in the controversy. At the center was the criticism that the activists were never interested in having a reasoned, open discussion with the Lab. Instead, the activists were seen as having a pre-established agenda, which they sought to achieve in any way possible. The activists' goal was always to shut down the nuclear reactors at the BNL facility. Some of the groups also sought to shut down BNL. Activist groups were characterized by community residents as not being open-minded, and open-mindedness was seen as an important attribute for good discussion and learning. The following quotation again conveys the notion that community residents saw themselves as needing to listen to both sides :

Groups like STAR. The problem with some of those groups that we've found [...] is that, it seemed that they had their opinion made up before information was given to them. And we [the civics] tried very hard not to do that.

Community Residents saw themselves as skeptical of BNL, concerned that there might be a serious problem, and willing to do what it took to get at the truth. This individual did a nice job of comparing himself (and other civic association members) with the activists. In this quote

he mentions that he initially thought like the activists did, that BNL should be shut down, but as he learned more about the situation, he changed his mind. He also mentions his concern that BNL might have been lying to him and emphasizes that State and county agencies verified the data BNL was putting out.

There was one group that wanted that reactor shut down right away. They wanted the lab closed. They wanted everybody to pick up their stuff and get off Long Island, that they don't belong here because of our groundwater table—the sole source aquifer that we have in this area. And there still is a group that wants the lab out of there, I know that. We actually, at the beginning, we were thinking that way too. But after a while we figured out that it's not as bad as they're making out. Because they [the activists] used to put press releases out to *Newsday*. And we used to read them. And they were completely exaggerated what was happening over there. Because we knew what the concentrations were at that time. They were checked by the regulatory agencies--EPA, DEC [NY State Department of Environmental Conservation] in Albany, and Suffolk County Health Services department. They're checking all those readings and they all agreed with them. And they would come to the meetings and sit and tell us exactly how it was. So I felt nobody's trying to fool us here. That's what's going on. And it's the truth. And I didn't find any instances of where they lied. Yet, there were certain people from certain organizations that said they were lying all the time. And I couldn't see it.

Activists were also cited for grandstanding and theatrics, both of which prevented any reasoned discussion from taking place:

[A]t one of the meetings, one of the activists, a man that I'm sure you've heard and you may have probably have talked to, (name removed) stood up on the table and started bellowing [...] in order to attract the attention of the cameras, and he got his way. Because that was what they showed that night and the next morning, that they showed him standing on a table, expressing outrage.

Community residents spoke critically of anyone who had “an agenda.” By this they meant a political goal to accomplish, as opposed to the goal of reaching informed understanding. In critiquing those with “agendas,” these residents were expressing the ideal that the process ought to focus on getting the facts straight and making a reasoned decision. They reacted negatively to what they saw as the politicization of the controversy:

Not having an “agenda” is real important. People who have an agenda are not interested in really learning and getting the facts. They are interested in bending the facts and the meaning to suit their own agenda.

Long Island Activists Network

Characterization of the network

For the community of environmental, health, and social justice activists in eastern Long Island, a seminal event was the controversy over the construction of the Shoreham Nuclear Power Station during the 1980s. Activists on Long Island fought Shoreham from the first hearing in the 1960s until July 1991, when, fully constructed, operational, and ready to go on-line, the facility was instead permitted by the NRC to be dismantled. In the struggle against

Shoreham, activists from the region took on what seemed to be insurmountable odds and won. In so doing they learned how to collaborate with each other. They succeeded in self-organizing into a confederation of groups with a common goal. From the stories these activists tell today, the Shoreham experience was positive and empowering.

Activists in eastern Long Island also learned another lesson that would come into play again during the tritium controversy at BNL in 1997. They had seen how taking a hard-line stance based in principle and refusing to compromise had led to victory over forces that seemed unbeatable. That principle was that there should not be an atomic reactor on Long Island. Not only did this corps of activists stop the fully completed Shoreham facility, it also defeated plans for two additional commercial nuclear power stations on Long Island. In those controversies, activists succeeded in winning over public sentiment by conveying the notion that nuclear reactors were dangerous, too dangerous for the highly populated, difficult to evacuate, ecologically sensitive region of Long Island.

During the Shoreham controversy, the nuclear reactors just up the road at BNL remained uncontested. This was apparently because it was not widely known that there were reactors at BNL. Although some activists and community members clearly did know about the reactors at the Lab, it was not an item of widespread public scrutiny.

The string of controversies at BNL over the 1980s and 1990s that culminated with the tritium controversy of 1997 drew the attention of activists to the Lab. And while individual events such as wildlife contaminated with radioactivity, radiation releases to the Peconic River, and hazardous chemical emissions to the ground and air were important in motivating activists' opposition to the Lab, the controversy with BNL was fed and sustained largely by the same factor that sustained the Shoreham resistance – a vision of Long Island without any nuclear reactors.

The activist community of eastern Long Island includes environmental activists. One major environmentalist party is the Long Island Pine Barrens Association. The Pine Barrens of Long Island is a sensitive ecosystem presently being protected by land conservation and land management practices. Trout Unlimited is another major environmental group in the BNL controversies. They were especially concerned with tritium contamination in the Peconic River. Another important segment of this network are the public health organizations. One in Nine is a group that focuses on the issue of breast cancer. Because of the connection between radiation and breast cancer, this group was particularly interested in radiation controversies in the region. Another local group, Citizens for a Clean Brookhaven was also based around a concern that the Lab's emissions might be causing illness in the local communities. The third type of group involved in this network was the peace and social justice groups. Groups such as the Long Island Progressive Coalition and the Long Island Alliance for Peaceful Alternatives had been active on the Island for years. (These are just a sampling of some groups, many others exist and also comprise this network.)

Two other groups came to play significant roles in the tritium controversy of 1997. The first was STAR – Standing for Truth Against Radiation. STAR is a Long Island activist group located in the upper-class vacation community of Easthampton (more than an hour East of the Brookhaven Lab). STAR formed in 1997 just after the tritium leak was exposed. They were

attracted to the issues at Brookhaven, which were, at that time, receiving a large amount of media attention. Although they are not neighbors to the site, their influence has been significant in part due to the wealth and fame of the Easthampton area. STAR has grown to become a nationwide organization since the dying down of Brookhaven controversies. STAR activists also still attend the Citizens Advisory Council, where they encourage the Lab to develop research programs into alternative and renewable energy sources.

CALA, the Community Alliance for Lab Accountability, was the second group that developed during 1997. When the grant that set up Environmental Advocates destroyed the CWG, some of the activists proposed they meet together to discuss coordinating their actions with regard to the Lab. CALA is a Brookhaven Lab watchdog group comprised of 33 environmental, health and spiritual organizations in the eastern part of Long Island. It arose from a common concern regarding environmental contamination emanating from BNL and serves as a focal point and primary organization for residents and community groups to get information, recommend policies, and register health, environmental and moral concerns about BNL's operations. STAR is a member of CALA.

The early CALA meetings were attended by DOE and BNL officials. They hoped to continue communication with their critics, as the public participation specialists Hans and Annemarie Bleiker strongly advised BNL to do. But the birth of CALA was not easy. Twenty-five activists with different interests and objectives were difficult to weld into one unit. During this process, DOE and BNL were asked to leave. In time, CALA did compose a mission statement, which specified the agenda they hoped to accomplish with regard to BNL.

By unifying the positions of diverse groups, CALA has become an environmental, health and ethical organization that is recognized by BNL and the DOE. Its member groups represent more than 50,000 Long Island residents. CALA's mission is to act as an information clearinghouse for member organizations and the public, to initiate community education and to reach out and establish a direct line of communication with BNL and DOE for the purpose of gaining information and demanding accountability. CALA has demanded environmental representation on BNL's new board of directors, and has established a means of consistent and direct communication between CALA and lab management through monthly meetings. The member organizations work together and separately to develop comments and recommendations on lab operations.

Perceptions of risk: Deep concerns for the harmful effects of radiation

DEEP CONCERNS FOR THE HARMFUL EFFECTS OF RADIATION

Based on the discussions we had with people in this network, it is reasonable to claim that a fundamental belief for people in this network is that radioactivity is a serious and dangerous matter. Interviewees regularly cited testimony from experts—in particular Helen Caldicott and Jay Gould, but others as well—who claim that even one atomic disintegration is capable of causing cancer, thus there is no “safe” level of radiation dose. Consequently,

even low dose radiation risks could be significant threats to human health. When asked about the tritium releases, this activist replied:

Of course they are a concern. Look in any medical book, it tells there's no safe level of radiation. Of course they're a concern.

There is a corollary to this belief that is also central to people of this network. This is that radiation, even at low levels, when combined with other risk agents, can have effects on human health that are greater than the sum of each of the risks. For instance, it is known that cigarette smokers exposed to radon gas have a risk of developing lung cancer that is many times greater than the sum of the risk to smokers not exposed to radon plus the risk to non-smokers exposed to radon. This interviewee put it more clearly:

And they [the low level radiation risks] are also a concern in a way that they [the Lab] never address, they *never* address. They never address the synergistic effects of radiation with other toxic chemicals. And they...everybody knows that it enhances its toxicity.

TRITIUM RISK AND NUCLEAR WEAPONS RESEARCH

Our results show that the activists in this network did not perceive of risk in the singular dimensional language of risk to human health. They interpreted the risk of the tritium in many dimensions.

Whereas people in the Friends of BNL network readily spoke about risk to human health from the tritium when we inquired, and people in the Community Residents network spoke about trust (or distrust) in BNL, people in this network were quick to point out that risk had to be interpreted in a larger context. For this individual the context included the mandate of the DOE to make nuclear weapons.

...what's important for me is to relate to you that I see this in a context. This is not the tritium, this is not this, it's not that. It's a package. And that package comes about by virtue of the fact that the DOE, its purpose is to make nuclear weapons. And to make nuclear weapons, you have in mind the mass murder of hundreds of millions of people.

In this perspective, the controversy about the tritium is not simply a controversy about the human health risk from this single hazard. It is one of the scores of unwanted side effects of a nuclear weapons culture. The tritium in the groundwater becomes symbolic of the insanity of creating weapons of mass annihilation. Thus, it becomes impossible (logically and morally) to disassociate any single contamination event from the entire weapons program.

TRITIUM RISK AND BNL'S ATTITUDE TOWARD RADIATION

Interviewees from this network routinely told us they believed that the Lab did not care about releasing some radiation into the local environment. As evidence, they cited Lab advocates who argued that small amounts of radiation were actually therapeutic (the hormesis effect). They also cited statements made by Lab personnel that indicated the belief that small amounts of radiation were not dangerous. In addition, they cited government

personnel who argued that the important science that the Lab was doing justified any accidental releases.

So we met with this congressional investigator, named [name removed]. And we kept showing her more evidence of environmental abuse, what about this and this, and finally we could tell that she really didn't want to hear too much about it, she was just going through the motions. So after everyone else had left and I was left there with her alone, after peppering her with about 5 other things that I wanted to show her, she turned to me and said, "[first name], *did you ever think that you would have to live with additional risks because of the good that Brookhaven lab does for the entire country?*" So I looked at her and I said, "So what you're saying is, that it's okay to kill a few, for the good of the many?" [italics added]

It is not inaccurate to report that activists (as well as many in the Community Residents network, see above) concluded that the Lab just did not care about the environment or the local community.

TRITIUM RISK AND BNL'S ATTITUDE TOWARD THE COMMUNITY

Uncaring, arrogant, and patronizing sum up how activists depicted BNL's attitude toward the neighboring communities, as these two quotations illustrate:

East Yaphank, Mastic Beach, Mastic, Shirley [the communities directly south of the Lab], those are working class people. You know, they're written off. Those are the people who sacrifice for them to get Nobel prizes over here. And they don't give a shit! They don't give a shit about those peoples' lives.

Their whole attitude is arrogant. They know what's best for you. You should just sit down and be a good sheep and we're the intelligent ones and we're going to tell you what's good for you and what's harmful for you and you have to believe us. You know the whole thing with the acceptable levels of radiation, to me, my opinion is an acceptable level is just an acceptable death rate. We expect so many to die when exposed to this amount of radiation, and that's okay for us. But if you're one of those people, it's not okay.

To these activists, BNL's attitudes toward the community are part of the reason that tritium leaked in the first place. If BNL had listened to the public and installed monitoring wells outside the HFBR as requested in the early 1990s, much contamination could have been prevented. But the Lab did not assign high priority to what the community wanted. It did not put in the wells until much later.

On top of this, activists frequently mentioned to us the Tiger Team report from the 1989 assessment. In that report, according to our interviewees, was a paragraph that stated that the investigators revealed an attitude among BNL scientists and management that science comes before environmental protection. The idea that BNL would demote environmental protection to the preference of scientific advancement was atrocious for people in this Network. Several members of the Community Residents Network also cited this data source and expressed the same level of outrage at BNL.

Consequently, for people from the Long Island Activist network, the attitude of the Lab and of employees at the Lab toward the local community is an important dimension of the risk due to the tritium. This interviewee summarized it nicely:

Well, I think that the tritium is a microcosm of everything that Brookhaven lab has done. It's just one example of how they polluted the environment. They've ignored the community around them. You know things that they probably could have prevented and they didn't for a couple of reasons. You know, 1) they didn't think it was important, 2) they have a very understated opinion on how dangerous tritium and other types of particles are, and 3) it's just science first. You know, it's science first, and everything else should be secondary to that. And that's what I believe their opinion is.

RISKS TO HUMAN HEALTH FROM THE TRITIUM

It was difficult to get our interviewees from this network to express a perception of the risks to human health posed by the tritium in the groundwater. One person simply stated it was "extremely important." The tritium plume contaminating the Peconic River was cited as an important source of health risks to people eating the fish. For the most part, however, people avoided answering the question directly, instead choosing to respond to other dimensions of the risk. For example, this exchange was typical:

Q: What's your thought right now on the tritium in the groundwater? Is it dangerous? Is it bad?

A: Well you never want a radioactive element in your groundwater.

Others saw it as a matter of principle:

It [tritium] doesn't belong in the sole source aquifer. You don't contaminate drinking water.

Still, it is probably fair to say that most of the activist environmentalists who now communicate regularly with the Lab seem to feel that the tritium that leached from the spent fuel pool at the HFBR is not a major human health concern at the moment, nor is it likely to be in the future. That does not mean they are satisfied with the Lab, that they do not want to see the medical reactor (or the Lab) shut down, or that they do not feel revisions in the way BNL handles radioactive waste and emissions are necessary. Several other dimensions of risk associated with the tritium release remain salient for this network. However, the tritium that was released from the spent fuel pool at the HFBR, that is sitting in groundwater beneath the Lab, is mainly accepted as an unwanted, but non-dangerous consequence, mainly because, if the present understandings are correct, there is no pathway for human exposure to that tritium.

The person quoted above went on to explain that BNL violated the public trust and that the tritium should not be there and, therefore, it should be removed. Then he continued to say:

Well, you know, to us it's, you know, one more contaminant in the groundwater. And you know our groundwater in Long Island, we're sole source aquifer, we're filled with contamination. We have organic chemicals, we have pesticides, you know the whole gambit, you know, of things that we shouldn't be drinking in various levels. So, you know, it's not a good thing. *But you have to keep it in perspective with everything else* (emphasis added).

Another well-known activists very critical of the Lab put it this way:

But, I mean I guess, in the strictest sense if you had to ask me what the immediate health risk was of that tritium from the spent fuel pool, if it's all on site, even though it's in really high concentrations, nobody's drinking that at the moment. But I think that they still have a responsibility to clean it up to deal with it responsibly and there shouldn't be tritium at 32 times the drinking water standard in our aquifer. That's the bottom line, they put it there, they have to clean it up. But nobody is actually, you know, is anybody drinking that immediate water right there? No, but that doesn't give them the excuse to put it there or keep it there.

Clearly the activist community is especially concerned with the leakage of any radiation and they are particularly concerned that even very low doses of radiation can be harmful. However, the general assessment in this network seems to be that there is presently no way that people can be exposed to the tritium so long as it remains where it is reputed to be.

RISKS ASSOCIATED WITH REMEDIATION

Of course, pumping out groundwater and reinserting it into the water table further upstream could potentially create some exposures. For instance, we mentioned the concern of the National Weather Service employees at a small facility at the Lab, near the recharge basin. We also mentioned earlier that some 95,000 gallons of tritiated water was trucked to Oak Ridge, where it was allegedly evaporated off. The environmental activists did express a concern for worker safety, but they still supported the removal and translocation of the tritiated water for two reasons.

First, they felt that BNL needed to correct its mistake. There are two motivations for this. For some people it was a punitive action made to teach the lab their lesson. For others it was a matter of social responsibility. Brookhaven acknowledged that they had made mistakes, those mistakes should be remedied. If the Lab got away with merely an apology, this line of reasoning went, then they might not be motivated to change their behavior. Several people in this and other networks pointed out that BNL initially assigned the contamination little importance. Getting BNL to recognize that they needed to treat radioactive contamination much more seriously was key for the activist community.

Second, they wanted the tritium removed as a precautionary measure, to ensure that there would be no further exposures or damage caused. While, for the most part, the activists accepted that the groundwater modeling was correct, they did not harbor a high degree of certainty in the model. If the model were wrong, or if there was a portion of the plume that was incorrectly modeled, then the tritium could potentially contaminate more groundwater, which may lead to exposure. Since even very low levels of radiation are considered dangerous by people in this network, any exposure would be a cause for concern. For both of these reasons, activists supported remediation of the tritium.

Information shaping risk perceptions among Long Island Environmental Activists

As stated above, risk perceptions of this group of people are multi-dimensional, taking into account much more than data about the concentration of tritium in the groundwater. For this group, concentrations are not very meaningful for two reasons. First, any concentration can be dangerous because there is no safe level of radiation dose. Second, because of the likelihood of synergistic effects, even low levels of radiation can possibly have devastating effects on human or ecological health. Because of this, technical information about the tritium was of less importance than it was to the other two networks.

INFORMATION SHARED WITHIN THE NETWORK

For people in this network, one of the key sources of information was the other activists in the network. The activists we interviewed mentioned that they felt competent to do their own research, to learn about the issue that motivated them, and to reason out a solution. Thus, people who felt their health had been compromised by the Lab gathered together in groups such as Citizens for a Clean Brookhaven or One in Nine. In these settings they worked independently and came together to share what they had learned. Later on, CALA would become the hub of the activist network. Sharing information among other like-minded activists became a core function for CALA.

If there was a great study, somebody would make the copies, disseminate it out. You know, a good research article on something. We always used it [CALA] as an information exchange. That was one of the great features of it.

We all had set up groups to try to research different aspects of what was going on and then report back. You know, we had initially wanted to set up a library of what we found out and things like that.

The library never did get off the ground. Instead, STAR came onto the scene, promising to be a clearinghouse for information about radiation. Once STAR was born, activists reported that they relied on it for information about the lab and about radiation in general.

When the STAR foundation came along, that was my source of information.

Mention was also made of controversies among the activist community during the emergence of STAR. We did not delve into this topic during our interviews, but it would be interesting to examine how STAR won over the trust of this community.

INFORMATION FROM ACCEPTED EXPERTS

Members of this network did rely on information from experts who lie outside the network focused on the local impacts of BNL on eastern Long Island. Two expert scientists were particularly prominent in this debate. These were Dr. Helen Caldicott, M.D. Dr. Jay Gould, Ph.D.. Both are nationally known figures active in the debate about nuclear radiation.

Dr. Caldicott was frequently cited for the assertion that even one single atomic disintegration (the smallest dose imaginable) is capable of initiating cancer.

...and I read Helen Caldicott's book, and did a lot of things like that. And it started to make me realize. I started to form my own opinions about it

One of the reasons Dr. Caldicott was involved so much in this case was because she lived nearby:

And I went to her house, which was cool because, I mean, in college, as an undergrad back in 1979, one of her books was required reading in one of the classes that I had, and that was pretty cool, right?

INFORMATION RECEIVED FROM THE LAB

The activists we interviewed reported to us that, during the controversy, they did not receive useful information from the Lab. People were skeptical about what came out of the Lab. They saw it as PR material meant to change attitudes.

I would read their stuff but I never got anything of value from the lab; it was all sugar-coated and media promotion.

Other individuals were a bit more open to reading what the Lab put out, but they too were wary of the Lab's bias:

And we were getting a lot of information from the lab—they were loosening up a little bit, giving us information. But then you know you always have that question about: Well this isn't really independent information.

Two other problems with getting information from the Lab were cited from activists we interviewed. Either the Lab would respond with too much data, which activists interpreted as meaning to overwhelm and discourage the person who asked for the data. Or the Lab would respond with inaccurate data, which required lots of work to validate and correct.

See, part of what the lab does. They either took one of two tracks. If you asked them for something, they'd give you tons of information. You know, thinking, "Get through that." Or, they would give you some bogus sheet that we would find riddled with inaccuracies. Like a fact sheet, or you know. We thought that the information that they handed out was really inaccurate. So, and then we would get together and go through it and figure out why it was inaccurate and go back to them and they would agree and change it.

When the activists mentioned that they did not rely on information from the Lab, they were clearly speaking about a particular type of information—mainly documentation of the tritium contamination, the Lab's past practices, and evaluative information about the performance of the Lab or the acceptability of the risk posed by the tritium. Information of those types was not relied upon by activists. But even if they did not necessarily trust or believe the information coming from the Lab, activists did read the information and used it to inform their perceptions about the Lab. For instance, some people concluded that the Lab lied to the public, a conclusion that requires listening to what the Lab says to the public. In addition, activists relied on other types of information to form judgments about the risk. For example, a Lab official rolling his eyes at a citizen complaining that the Lab poisoned her children is information that informs a judgment about the consideration or caring the Lab exhibits for the local community. We conclude, therefore, that activists did use information

from the Lab, but not necessarily all types of information and not necessarily in the manner the Lab might have hoped they would use it. These activists did not accept the Lab's judgments or conclusions. But they scrutinized the Lab's communiqués for consistency and validity. They scrutinized the behavior and demeanor of Lab representatives for authentic concern for the community and the environment. Because they concluded that the Lab was not being honest or forthright, the information about the tritium that the Lab supplied contained little credibility for the activists.

Over the several years that have past since the tritium was first revealed, the Long Island Environmental Activist community has come to a working relationship with BNL. Leaders from STAR and CALA now sit on the Lab's Citizen Advisory Committee and others work together with the Lab on other projects, such as the clean up of the Peconic River. To some extent this cooperation may be possible because, in essence, the activists succeeded in achieving one of their major goals—the decommissioning of the HFBR. But the cooperation is also possible because of the change in attitude within the management of the Lab. Several activists pointed out to us that Marburger was a “good man.” He was truly interested in listening to what the activists had to say and in trying to find ways that the Lab could act on their concerns. The result has clearly been a better working relationship between the Lab and the activists. Consequentially, we now hear the activists talking about the Lab as a source of information. Certainly they do not accept everything the Lab says with blind faith, but when we asked people about their present perceptions of the tritium risk, the activists indicated that they were using information from the lab to inform their opinions.

For example, it was stated above that the estimates about the risk are heavily dependent on an accurate understanding of the state of the contamination and the likely movement of the plume. The data about the location and movement of the plume come from BNL. Activists are now using these reports to form their own opinions, although they may retain some guarded suspicion of the Lab's data. “If the plume is where we think it is...” said one activist, before issuing his estimation of the present risk posed by the plume. Nearly all people we interviewed were willing to accept that the plume is fairly well understood and that the hydrogeologic model is probably correct. However, many of these same people held this belief tentatively, ready to reject the present understanding the moment that contrary data become available.

Learning about the risks: Education within the Long Island Activists network

Activists were eager for information and knowledge on all issues associated with the Lab and the tritium contamination. They sought to educate themselves as quickly as possible. But, as mentioned above, they were loath to be educated by the Lab, for fear that the Lab's biases would distort the knowledge being disseminated.

A great deal of education was enabled via CALA. This organization tightened the activist network tremendously. Subcommittees were formed that specialized on certain topics. The people on these committees did research and reported back to the whole group, sharing what they learned with everyone. And since the people on these committees were

also active in other organizations, and since some of these organizations were national in scope, people in CALA had access to a tremendous amount of information.

Many of the organizations in CALA had their own expertise. One group has a professional hydrologist on staff. Others hire ecologists or health experts. These experts became resources for the whole of CALA.

What we would do is, [...] if it was some document that was 400 pages, he [person from another group] would have people that he knew read through it. [Our] hydrogeologist, um, she would read through some of the groundwater reports. And then we would compare notes and figure out what's important and go from there. Uh, with the health survey, for instance, we relied a lot on the breast cancer groups because they had done health surveys of their own. They had worked with experts who do health surveys and when we analyzed the Brookhaven lab so-called health survey, uh, the breast cancer groups were the ones to say, "This is absolutely ludicrous. This is bogus."

Some people on these subcommittees in CALA developed a very tight relationship. we'd each read it and then we used speak three times a day.

LEARNING ABOUT HOW EACH OTHER THINK ABOUT THE CONTROVERSY

A major difference between people in the Community Residents network and those in the Long Island Environmental Activist network was that the former reported that they got a lot of information and knowledge from the Lab while the latter group minimized the value of information from the Lab. In fact, this individual reported feeling that the Lab came to the meeting more for the purpose to collect information than to deliver it.

Q: So what kind of information would BNL present at these kinds of meetings?

A: Nothing that we didn't know before. I mean, sometimes it felt like they were trying to find out how much we actually knew instead of the other way around.

Q: So they didn't provide any information to you?

A: They would try that. But it almost seemed like... they would try to find out where we were coming from. "Let me see what my opposition is thinking." You know, that's how I felt sometimes.

This theme of BNL seeking to learn what the activists know was not widely reported in our interviews with people from this network. It is difficult to interpret the importance of this observation. On the one hand, it may indicate that BNL was doing what its public participation advisors told it to do—to go out and “know your audience.” The purpose for that might have been very innocent—so that they could better communicate with them. On the other hand, BNL may have sought to understand how the activists were thinking so that BNL could predict the rhetorical strategies of the activists in the battle to win over public opinion. In any event, it is probably fair to say that, whenever two groups are in conflict, they each seek to understand how the other is thinking.

As an aside to this, we note that a clearly stated (and never challenged) purpose of the community working group was for BNL to test its risk communication messages before sending information out to the general public. In other words, BNL also sought to understand how people on the CWG would respond to certain messages.

Factors shaping risk perceptions of Long Island Activists

Based on these interviews we learned that six main factors seem to be most responsible for explaining how individuals in the Long Island Activist network developed opinions about the risk from the tritium in the groundwater.

Box 4-3

Factors shaping risk perceptions for Long Island Activists network

- Belief that there is no safe level of dose to radioactivity.
- Adherence to the precautionary principle
- Belief that the nuclear weapons are morally wrong
- Sense of responsibility to protect public welfare and environment.
- Lack of trust in Lab employees
- Technical information from independent sources

First, members of the Long Island Activist network firmly believe that there is no level of dose from radioactivity that is 100% safe. This is the so-called “no threshold” model.” This statement was not necessarily disputed by the Lab. An interviewee from the Lab described the Lab’s position like this:

We did not take an opposite view that there was threshold or anything like that. Our statements are always, “There is some risk. This is the level of risk as we understand it. It’s a very small level of risk, we think, what do you think?” And we would try to compare it to other types of risk.

Still, the general feeling among our interviewees from the community was that the Lab *was* implying that the risk was acceptable. The activists took the opposite view, that the risk was unacceptable.

Second, the activists we interviewed ascribed to the precautionary principle in this instance. That is, they preferred to err on the side of safety instead of err on the side of the Lab. This principle presumes that safety and Lab goals are in competition. Obviously, safety is also one of the Lab’s goals, but the gist is that scientists or Lab management might be willing to risk a spill in the interest of fulfilling their mission, if they feel that the spill is likely to be largely

harmless. Activists who believe in the precautionary principle instead would argue that safety should be demonstrated beyond a doubt before moving ahead with actions to complete the Lab's mission.

Third, many activists believed in the fundamental immorality of nuclear weapons. And, although BNL did not construct nuclear weapons, it did contribute to their development in indirect ways. Furthermore, the Lab itself is owned by the DOE, whose mission includes the development of nuclear weapons.

Fourth, the activists in the Long Island network feel a sense of responsibility to lobby for interests that are often disadvantaged in the policy sphere. This includes interests such as those disenfranchised by the political system (frequently minority groups), but also children, future generations, and the environment. This sense of responsibility is linked to the belief in the precautionary principle (above).

Fifth, at the time this controversy began, members of this network did not trust the Lab. In fact, one could even go so far as to say they actively distrusted the Lab. The origins of this distrust are many, but it characterizes the initial condition for this network. This is a difference from the Community Residents network who did not actively trust or distrust the Lab at the onset of this event.

Sixth, activists shaped their risk perceptions by drawing on knowledge and information from their own research or from sources they believed to be independent from the DOE and BNL.

Influencing other peoples' risk perceptions

One way to depict this controversy is to see it as a battle between BNL and the Long Island Activists for public opinion. The Friends of BNL network wanted the public to believe that the risk from the tritium was minimal, that the Lab was responsible, and that the Lab cared about how it affected the environment. The Long Island Activist network, on the other hand, wanted the public to believe that radioactive contamination of any level was unsafe and that radiation did not belong in this sensitive and heavily populated region of Long Island. One interviewee from the Friends of BNL network expressed it this way:

But there's not a [...] public health problem for members of the community. That was basically our message. And the basic message of the people that were opposed to us was primarily, "Any level of radiation is bad for you and there's a risk to you." And so there was a very strong dichotomy in our messages.

The activists made moral arguments about the insanity of nuclear weapons, but their most effective strategy was to scrutinize BNL's behavior and to reveal to the public signs of incompetence, inconsistency, or uncaring on the part of the Lab, knowing that such revelations would lessen public trust in the Lab.

The Lab's strategy at first was to engage in the moral argument, espousing the benefits of science. They also took issue with what they saw as inconsistencies in the activists' arguments, as this quote from a BNL employee exemplifies:

They were just bent on an anti-nuclear front and all nuclear is bad. Meanwhile you don't see anti-nuclear groups trying to shut down hospitals, which rely very heavily on nuclear medicine.

However, it soon became clear that the Lab was losing public trust rapidly, and, to their credit, they switched their strategy to focus on establishing a constructive conversation with the civic organizations immediately around the Lab.

Creating a climate of distrust and anger between Friends of BNL and Long Island Activists

Activists we interviewed objected to several different tactics that BNL used during the controversy. One activist reported how BNL employees would attempt to discredit him in front of other members of the public. The following quote refers to a meeting where an activist tried to connect with a local citizen who expressed fear and outrage at the Lab. When he approached this woman after the meeting and was speaking with her he noticed:

And these people walking by who were obviously from the lab, were walking by saying [to her], "Don't listen to him. He doesn't know what he's talking about." You know, it's just that kind of attitude, you know, after awhile it grates on you.

Such behavior indicates a fundamental lack of respect on the part of these Lab employees for this individual. In addition to this we heard other anecdotes about BNL employees threatening or intimidating activists at public meetings. One activist recounted a public meeting she attended at a local library:

I mean like lab people were screaming at community people. There was almost a fight in the hallway. It was like...really surreal. This one scientist came up to me and there was a picture of Alec Baldwin like on the front of like Cigar magazine and he's sticking it in my face and going, "See that? See that? What the hell kind of guy is this that you're working with?"

To be sure, intimidation of this nature was prevalent on all sides. A videotape of a public meeting captures a community member insulting a BNL manager with incredibly vulgar language. Another Lab employee was set up by the local media and embarrassed in public. Many community members claimed that people at BNL lied outright. People at BNL claim that people accused them of lying in the most rude, direct, uncivil manner. Certainly people from all sides behaved in what is commonly believed to be inappropriate civic behavior. Others mentioned that this is simply the nature of Long Islanders:

We are have a real "in your face" mentality here.

A similar encounter, this time with a community resident, not an activist, also ended up discrediting Brookhaven in the long run. Apparently, an employee at the Lab attempted to

discourage a local citizen from listening to local activists. The citizen recounted the interaction with the BNL person:

I remember [BNL employee] saying something to me that really, it really bothered me, and it really, it probably set me in motion more than anything, [BNL employee] said to me, “You can’t trust [names activist]” “Don’t trust him. Stay away from him. And don’t trust [another activist]. And don’t trust [a third activist].”

BNL employees would attempt to infiltrate activist organizations covertly by presenting themselves as merely “interested citizens,” and not mention that they worked for the Lab.

We had one situation where at a Citizens for a Clean Brookhaven meeting, a woman showed up that we didn’t recognize and she just said, “Well I’m just a community member.” And, so, we made her feel welcome. Then at the next meeting at the Brookhaven lab, we saw her there. And she turned out to be an employee that just got transferred over to the community end of it. She blatantly lied to us. And said that she had no affiliation with Brookhaven lab or anything. So, it’s very difficult to have a good rapport with people that are not honest with you.

Additionally, BNL employees would attempt to participate in local government decision making about the Lab while disguising the fact that they work for the Lab. Perhaps they were concerned that, if they revealed their affiliation, their opinion might not carry as much weight as that of an impartial “concerned citizen.” In one instance recounted to us, a BNL manager wrote a letter to the Suffolk County Task Force, suggesting they stop exploring a radiation issue with the Lab.

The county legislator, Judy Fields, who sponsored the bill funding the Suffolk County Task Force, got a letter from an independent citizen who questioned the validity of the Task Force, and why would we would waste money on the task force looking into this issue, and why we would listen to people that don’t know what they’re talking about. So I asked her, I said, “Well, who would write such a letter?” She said, “Well, a citizen from Stonybrook.” Actually it was [names town]. I go, “What is his name?” She answered, “Well, his name’s [name removed].” And I say, “Oh, he is one of the top people at Brookhaven lab.” In the letter he failed to mention that he also worked for Brookhaven lab! And he was high up in the management of Brookhaven lab! You know, every time you’d walk into a meeting, he’d come up and greet you and shake your hand, and be as nice as anything to you. And when you’re not looking he’s stabbing you in the back.

Stacking public meetings was another tactic of which Brookhaven was accused. Moreover, there were claims that BNL not only stacked meetings, but attempted to mask this stacking.

I went to another meeting where one of their [the Lab’s] people was holding the meeting and a common tactic that Brookhaven Lab would do is when they would have a community meeting, they’d fill the room with Brookhaven lab employees. And they would say they are also part of the community. You would be outnumbered 10 to 1. And at one particular meeting I raised my hand and I said, “Could I have a count of all the people here who work at Brookhaven lab?” And the guy, he refused to do that, he refused to do a head count because I knew we were outnumbered by 95 to 5.

Another argument was that Brookhaven succeeded in getting placed on its community boards citizens who either were married to Lab employees, who were retired Lab employees, or who were independent contractors paid by the Lab. This, in essence, gave the Lab more representation than some people thought was proper.

And so the funny thing is some of the community boards, or the community groups were made up of Brookhaven lab employees. Or, the wives of...you know, friends of Brookhaven, which the wives or the people who work there. Or another fellow, [names person], was a former employee of Brookhaven lab who now was an independent contractor, and all his work was funded through Brookhaven lab. He called himself a community leader, and he had vote on it. So it was the DOE having a vote, it was Brookhaven lab having a vote, and then these different community groups that all had ties to the laboratory.

Another complaint had to do with the way that BNL tried to limit public input by producing thick reports and asking the public comment on it in an unreasonably short period of time. This interviewee speculated that, while this may have been a strategy of the Lab's to limit public involvement, and while the Lab may have succeeded in doing so in this instance, the cost was actually quite dear.

They've taken two years to fill out a document that thick, and give it to the public and say you've got a ten-day review period. Huh? So it takes them two years and they want you to review it and comment on it in ten days?! So if that doesn't generate cynicism, I don't know what does.

All of these phenomena helped to contribute to establishing a relationship between the Friends of BNL Network and the Long Island Activists Network that was characterized as distrustful. It was a relationship filled with anger, outrage, and suspicion. What is remarkable is that the people engaged in this controversy were able to get beyond these confrontations and still find a way to communicate with each other, as the next section describes.

Convergence Network: The Community Working Group

The three networks described above interacted, argued, cooperated, and competed with each other during the course of this controversy. Of course, this event should be interpreted as one in an ongoing history of interaction among these three networks. Nevertheless, the three networks formed very different stances and opinions about the risk, as summarized in the Box 4-4 below.

Network	Initial Position	Logic	Principles
Friends of BNL	Probably not dangerous, don't look into it unless we have to.	We would have known about it much earlier if something big had gone wrong.	Trust science Trust lab. Science is good for society Presumption of Lab's innocence
Community Residents	It may be a dangerous, look into it immediately as if it were.	Organizations tend to be irresponsible. BNL has a lot to loose, they may be hiding something.	Good environmental practices need to be enforced with good leadership and good oversight No presumption of Lab's innocence or guilt.
Long Island Activists	It certainly is dangerous, and it's probably only the tip of the iceberg.	BNL and DOE don't care about local place or people. They only care about advancing the use of radiation.	Radiation is deadly. Presumption of Lab's guilt.

Box 4-4. Summary of the three main social networks and their stance toward the tritium controversy.

Members from these three networks came together in many places. Indeed, some individuals participated in more than one network, although no one participated in both the Friends of BNL and the Long Island Activist networks.

One of the most important places where these networks originally came together and interacted was in the Community Working Group. The CWG has its origins in the days before the tritium was discovered (see section on CWG in Chapter 3), but, as with many things, it was the tritium that accelerated its development and demise. The purpose for discussing the CWG in this report is to comment on its importance as a setting where people from the different networks came together to discuss the risk controversies at the Lab. Some of the data we gathered in our

interviews refer to the year 1996, a time before the tritium was discovered. But since the same people were involved throughout the chemical controversy of 1996 and the tritium controversy of 1997, it is difficult to untangle the two events.

Unlike other DOE Labs, Brookhaven did not have a Site Specific Advisory Committee. In fact, the Lab had no regular contact with citizens, activists, and local government in a form that might be considered a citizens advisory committee. As the controversy matured, the Lab quickly realized the benefits such a committee might hold. Membership in the CWG was open to anyone, but certain individuals were invited to attend.

AS A VENUE FOR DISCOURSE AND INFORMATION GATHERING

A fair depiction of this controversy is to see two sides in opposition to each other with the community residents watching the debate, acting as a jury, trying to decide which side to believe. But the representation in this picture does not credit the community residents with taking the initiative to research and learn about the risk and the Lab, which many of them did do. Several community residents who we interviewed mentioned that they not only listened to both sides make their arguments, they also did their own research in order to figure out which side was right.

The CWG became the main venue where BNL and the activists interacted directly and where unaffiliated members of the local community could listen to both sides discuss the issues. This was not the case in the other roundtables being hosted at Brookhaven. The Brookhaven Executive Roundtables did not create the same type of space. The Poster Sessions that BNL held for the purpose of educating people were also discounted by many interviewees as ineffective discourse spaces:

You were supposed to kind of like walk through...they signed you in, kind of gave you the greeting. Showed you the posters. And you could interact with everybody all along the way, but there wasn't an opportunity to say...you know, okay this is the responsible person, this is who we're asking questions of what's going on. I want answers to these things. And that's what so many people that I saw there, were getting frustrated with it. There was no ultimately accountable person. There was no interaction. It was this kind of, very controlled, assembly line type, come look, here's the picture, everything's okay, get the hell out of here.

The reasons why the CWG turned out the way it did probably have to do with: (1) letting the membership be open to anyone who wanted to attend, (2) BNL not taking over the process, but instead let the participants run their own meetings, (3) allowing there to be an authentic discussion among the participants.

The chief reason people went to the CWG was to get information. It was a matter of expediency. At the meetings, people could not only request specific reports be made available, but they could also learn about the kinds of reports and information that were available. For example, STAR was able to announce it was hosting a workshop that everyone could attend. BNL could announce the availability of a new document for public comment. And community residents could tell the activists about things they had uncovered, things such as the Tiger Team

report mentioned above. All the community residents we interviewed who attended these meetings reported that they were very helpful, as did many of the activists we interviewed.

In addition to raw information, people at the CWG meetings could also ask for and receive responses or reactions to information or comments. They reported that they were able to ask questions directly to the people who knew the answers, whether they be Lab employees, Lab management, or activists. In other words, residents could quiz STAR and BNL and compare their answers immediately. Residents or activists routinely asked BNL to comment on one thing or another. In turn, BNL used the CWG to receive feedback about their information or how they were being perceived in the community. But in the end, in the competition between BNL and the activists for public opinion, it was BNL who came out on top—for many of the residents with whom we spoke. The activist groups like STAR and so forth were appreciated for their information and perspective, but residents reportedly felt that the activists often overstated the case or made accusations that they were unable to support. This was not always the case. Activists also were able reveal insights that the residents appreciated. Residents also reported that BNL “clearly lied to us.” However, over time, they came to feel that BNL was now telling the truth, that BNL had changed their ways, and that BNL was acting with consistency, caring, and competence.

People who participated in the CWG reported it was a valuable experience because they learned a lot. So far we have focused on their learning about the technical side of the issue and learning about the attitude, perspective, intention, and reaction of the other participants and groups. This later topic was by far the most important for the CWG participants risk perceptions. The most notable change we detected in the risk perceptions of our interviewees came from the community residents. Both other groups—BNL and the activists—had their perceptions hardened by the interaction

DIFFICULTIES MAINTAINING THE CWG

While the CWG apparently served a positive purpose for many people involved in the controversy, it was not easy to maintain as an organization.

One of the problems that some people raised with the CWG had to do with its inefficiency. Because the membership was always open, it was difficult for the group to maintain any sense of progress. Instead, old discussions were repeated for the benefit of new members, something old members found annoying.

Like I said, you could have group of twenty people at one of these committee meetings sit through a three hour presentation on Long Island hydrology. And then the next meeting comes, and the person right by you in the room, who wasn't at the last one, and you go over it all again. And then the more people that came... it just became crazy after awhile.

Another problem was that of control and representation. The CWG never developed rules for establishing a head or a moderator. It was difficult to understand if the CWG was capable of speaking in one voice. And there was clearly a desire among some in the organization to be able to speak to the Lab with the authority of the entire CWG. The first meeting was, by some accounts, quite remarkable. The participants told all BNL members to

leave and set about organizing themselves. They chose a moderator and came up with a list of items they wanted BNL to address. But as time went by, differences of opinion within the group challenged it. The breaking point was when two members accepted a grant from BNL, which paid a small salary and established an office in the Lab for the CWG. Activist members were appalled at what they saw as betrayal, claiming those two people did not have the authority to take money on behalf of the CWG. BNL asserted that it could give money to whomever it pleased and it would not rescind its decision. This squabbling drove out several community and civic members who only wanted to keep learning, to keep the dialogue moving forward, as the following paraphrase from a community member expresses:

Everyone was pursuing their own agenda. I got sick and tired of it all!

In the end the group splintered apart. The activists went off to set up CALA, which BNL initially attempted to attend, but were not permitted. Other individuals set up NEAR and used the grant to get that organization off the ground. Still others used the opportunity to exit the whole process. Later, Brookhaven would establish a formal CAC, bringing together many of the original members of the CWG in a more formal and lasting organization.

Chapter 5. Results on Standards and Stigma Across Networks

Regulatory Standards

An important theme for our study was the role that drinking water standards play in shaping perceptions of the tritium risk. The most prominent and significant drinking water standards for this case are those encoded in the Federal Government's Safe Drinking Water Act. This is Federal legislation that establishes maximum concentration limits for a range of common drinking water contaminants. States and counties are free to establish more strict limits, which they sometimes do, but not in Suffolk County. Tritium is regulated in drinking water by the EPA at a level of 20,000 pCu/l (US EPA 2000).

This afforded risk managers the opportunity to establish the seriousness of the risk by comparing measured levels of contamination against the quality standards. Indeed many risk messages issued by the Lab did interpret the severity of the risk in this way. Measurements were taken at hundreds of monitoring wells inside and outside of the Lab, as well as at the taps of private homes. At some of the monitoring wells tests revealed the concentration of tritium did rise above the drinking water standard.

These water quality standards not only provided a baseline for expressing the level of potential harm, they also provided risk managers with a management objective. The implicit assumption made by the Lab was that, if the water contamination levels would be brought below those of the Safe Drinking Water Act, then the contamination would be acceptable. Brookhaven could argue it was doing nothing illegal. Several people we interviewed, such as this resident of the local area, accepted the logic of this approach, but were still wary:

Q: So these standards that they have...they're always comparing the levels with the standard.

A: That's right.

Q: What do you think of using that as a yardstick?

A: I mean, what are they going to do? They have to do something. You have contamination. It has to be cleaned up. Well, what do you clean it up to? And so they look for guidance from the federal government. I understand they have to have some standard. But on the flip side, as I just explained, those standards are not necessarily based on science. Sometimes they're based on politics. So when you look for a standard. You want a standard that's going to protect your health, not get through Congress. So these standards, there's a political angle woven into these standards that may not be a health protective measure.

Those at the Lab responsible for communicating about the risk to the public also agreed that they needed to use the standard as a yardstick. However, the argument never carried much weight because so many members in the audience rejected the validity of the standard.

It was often very important for us to say, this is a standard. This is where we are on the standard. And every time we could make that comparison, we would be at a very small fraction of the standard. But you get very little credit because in general there's a lack of trust in the community about standards and federal government.

Understanding where standards come from

Even the technical management at BNL admitted it was difficult to understand the origin of standards. Several attempts were made to bring in health experts to explain to BNL management how standards are arrived at. One manager (a scientist) concluded that:

It is very difficult to talk about just how the numbers are generated. The source data is very nebulous. And the extrapolation from acute doses to lifetime small doses is really gray. It is really a stretch. I never heard anyone explain it effectively.

Activists and community residents we interviewed all agreed that they did not understand how standards were computed. Much mention was made of the fact that tritium standards in Canada are different (higher) than those in the United States. Since Canada's standards are higher, activists generally avoided discussing them. Lab people, however, used that comparison to argue that the U.S. standards were probably over-protective.¹⁵

Believing the standards are protective

Among the Friends of BNL network, people generally believed that the standards did relate to a level of acceptable risk, even if they did not really understand how the standards were computed. For instance, although this individual admittedly did not comprehend how standards were arrived at, he did indicate acceptance of the standards. He mentioned that he trusted the people who set the standards, based on his limited experience with regulatory agencies.

I accept standards as the best guess of what is protective of human health. And I recognize that they can change. It's the best we can come up with now. In the cases I've been involved in, the regulatory agencies err on the side of being very protective, rather than taking a chance. "What the hell, let's make it 50 instead of 5." They just don't do that. And so I trust that the people doing this type of work think along those lines.

This suggests that this professional risk manager accepts standards as protective because personal experience with standard setting agencies and other professional individuals in standard setting activities leads him to trust the standard setting practice as a whole. There is also represented here a certain trust in the profession of regulatory science. This is grounded in his personal experiences with those professionals, but is probably also established by virtue of his relationship with the profession of science, in the broadest terms. He identifies himself as a scientist, thus any culpability for regulatory scientists is also a charge against his own identity. Thus to protect his identity as a scientist who does good in the world, he necessarily must ascribe to certain tenets. One of those is that people in the profession are competent and honest.

Although they believe the standards provide adequate protection, people in the Friends of BNL network mentioned that the public was not likely to think the same way:

¹⁵ We learned from one interviewee that the standard for tritium in drinking water was set at a concentration computed to match an expected dose. That dose is 1 millirem. The background dose for radiation on the average in America is about 350 millirem. Therefore, drinking water with 20,000 pCu/l radiation will increase your dose by about one day's worth of normal background radiation.

A. Even though we detected levels hundred times less than standard, it was still considered bad. “Why is that in my water? I don’t want it in my water!”

Q. So the only acceptable thing would be no incidence.

A. None. Zero. Yeah. Particularly with radiation. [...] With radiation zero is acceptable and that’s the only thing that is acceptable. You know, I heard that loud and clear from a number of people.

Believing standards are arbitrary, bogus, or inadequate

Interestingly, we heard from both Friends of BNL and Long Island Activists that the standards are more or less arbitrary and products of political haberdashery and little else. This Lab employee mentioned:

Oh the standard is a political thing. They have wanted to change the standard for years. It’s a political hot potato. There is no credible evidence to set the standard at 20,000 pCu/l. Other countries are much higher. Canada is at 50,000. They want to easily move it to 60,000. In reality, if you really look at it, that’s assuming that low levels are bad for you. The number of disintegrations we are talking about, compared to the normal demise of cells in the body is absolutely trivial. The body is getting rid of cells at a rate of 10,000,000 in a period of time and from radiation like this we are talking about maybe two. For me the standard is based on nothing but political stuff.

Which can be likened to this exchange we had with an activist:

Q. Well what’s your take on the standards, are they...too high...or are they too...

A: They’re bullshit. In a word, basically, I think that standards across the board are set by industry to do what they want and I think that standards are a sham, essentially for the most part.

Other people in the community were suspicious of the standards because they do not trust the Federal Government, much to the chagrin of this BNL employee:

I remember one meeting at Mastic Beach where [names person] was explaining standards. This guy just challenged him on it. “The government tells you that? Why do we trust the government.” [laughs] Typically, if the community knew we were adhering to state or EPA standards, there was a general acceptance, I think. In this case there was just a total lack of trust in government.

A third perspective we heard was that standards were inadequate because they are based on the assumption that all contaminants act on the body independently of each other. This ignores the fact that synergistic effects of compounds have been documented. This community resident felt that standards were a pragmatic way to try and set limits, but the standards do not necessarily accurately depict the health risks because they don’t consider the synergistic effects of two or more contaminants.

Q. Do you trust that they can determine a safe level. . . ?

A. Well, yeah, I'd say that that's reasonable to set limits. But I think where they ran into problems is when they can't tell you what happens when you combine it with other things. Yeah, they got a problem. We sat through endless meetings on VOC's and they tell you, ok, you've got five parts per billion in your drinking water, TCA. And then somebody says, well what happens when there's this one, this one, and this one?

Changing the standards

One theme we explored in the interviews was what would happen if the government increased the drinking water standard from 20,000 pCu/l to a higher number. Some people, like this community resident said they would accept the change out of deference to expertise:

Q: What if they said well we did some more research and now we think that 50,000 pCu/l is safe?

A: I would go along with that because I don't know. I can't argue with them. I can't say why did you use 20 and now you're going to 50? [...] I assume that there's more than 1 person involved in that operation and for me to say that 20 different scientists are wrong and coming up with 50,000, would be ludicrous, I'd be stupid to say that because I don't know. I have no idea.

Lab personnel, scientists, and other people who trust in the institution of science and regularly decision making would probably accept the new standard for the same reasons that they accept the present standards.

However, many people we interviewed indicated that they and others would respond very very negatively to change that made standards more lenient. This lab employee was speculating about what the general public would think:

Q. What do you think would happen if EPA made the standards less stringent.

A. I think there would be a revolt among people who follow that sort of thing. "You are putting us at more risk." There would be a negative response.

The perception of the standard

Two individuals at the Lab suggested that one of the biggest problems with using the standard is that it is expressed in the form of a large number. Since 20,000 picocuries/l could be expressed as 20 nanocuries/l or 0.02 microcuries per liter, was there a disadvantage or advantage to using one notation over another? This person went back and forth on the question:

A. The standard for tritium in drinking water is 20,000 picocuries per liter. If you don't know what a picocurie is, that doesn't help. Just the mere number 20,000 sounds like a lot. If we could all have \$20,000 sitting in our pocket, it's a lot of money. 20,000 picocuries is a lot. So, from a standards perspective it's difficult to communicate. You know if we could have talked about that in curies, it's a pretty small number in curies.

Q: So if they presented the standard, just in terms of 0.02 microcuries, you think that would make a difference in how the risk is perceived by most people in the community?

A: Yeah, I do. Yeah, I do. Absolutely. Numbers make a difference.

[then, later in the interview the person revisited this issue...]

A. You know, it's interesting that you ask that question with changing the standards. I question in my own mind, if you said it's .02 millicuries, maybe that they'd think it was such a deadly substance that you have to make the standard so low. I don't know. The mind's a funny thing--perception. But big numbers made a big difference, maybe if it were 2, or something like that, I think it would make a difference.

Stigma and its importance in the controversy

Clearly the stigma associated with radiation propelled a controversy that was originally about VOCs into the big leagues of risk conflicts. Radiation is a keyword that the media and activists used to trigger interest in readers.

The controversy over tritium in groundwater was never just a controversy about dangers to human health, although for some people involved that was surely a major consideration. Different people attempted to frame the controversy in ways that suited them. For instance, the Lab attempted to frame it as purely a concern about health risk, while the community residents and the activists tended to include the attitude and behavior of BNL management and employees in handling dangerous substances, the attitude and behavior of BNL management and employees in relating to the communities living around the Lab, and about the moral rightness of nuclear weapons, nuclear power, and nuclear research. As the conflict matured, BNL found itself fighting for its survival. While the DOE probably never seriously contemplated shutting down the Lab, the suggestion did receive coverage in the *New York Times*. People associated for the Lab began to highlight the economic benefits of the Lab's existence in the county and the social benefits of their research. Their trump card was nuclear medicine.

When people associated with the Lab, or sympathetic to the Lab spoke in broader terms, it was to defend the institution of science. According to this argument, science is valued for the products and techniques it produces. Nuclear medicine was the most frequently mentioned. X-rays, CAT scans, PET and NMR imaging are all benefits paid off from years of research into high energy physics. Cancer treatments that rely on radiation were also cited. The general strategy here was to break the stigma associated with radiation by pointing out that some radiation had positive social benefits

Secrecy and openness at Brookhaven

From people working at the Lab we heard about how the Lab had been open Sundays for years and years, that busloads upon busloads of school children came to tour the science museum, that the facility readily welcomed anyone who wished to visit and tour the site. However, this stands in stark contrast to the depiction of the Lab by dozens of our interviewees. Even community residents who came to trust the Lab acknowledged to us that, before the whole controversy began, the Lab was a big unknown to the local community.

The local perception of a closed, secret lab lead to stigma. The fence, the guards with guns at the gate all contributed to a perception of the Lab as a secret government facility. People complained that no one knew what went on in there. One interviewee mentioned that this came up at a civic association meeting:

People talked about what was going on over there, what they were doing and how concerned... you know they had *green glows* going on over there with the nuclear (*sic*) reactors and images of unknowns, so you think of aliens and all the rest.

The fence, the guard booth, the secrecy all contributed to a public image of a facility ignorant of its local context.

I had a neighbor who lived near me, and she said, well, “You work there at the lab? They make atom bombs over there.” And no matter what I would say, she would not be convinced that we did not make atom bombs.

The most significant aspect of stigma in this case was that the Lab reached out to the local public and, over time, managed to overcome stigma and build a positive image of the Lab in the community. The Lab invited local civic groups to come to the Lab, to attend roundtable meetings, poster sessions, citizen working group meetings, etc.

They had committees about clean-up, committees about budget. And they were asking people from the community to go in and talk.

And the Lab also packed up its overhead projectors and headed out to the community to explain about the Lab and the controversy. They worked to teach people about the Lab, to make them feel comfortable with the kind of research happening there.

Does tritium have its own stigma?

One of the questions that emerges from this study is whether or not tritium is developing its own stigma, distinct from the stigma associated with radiation in general. One clue suggesting this may be so is the ubiquitous comprehension and use of the term across all segments of the population versed in the controversy.

A second clue is the negative association people have with the term. People probably know that tritium is a radioactive compound, but they are also coming to associate the term with pollution. In other words, people in this controversy did not recognize tritium as a useful or desired product.

A third clue suggesting this question comes from a related controversy in California last year (Withgott 2001). A tritium-labeling facility at Lawrence-Berkeley National Lab was shut down by the NIH. Although NIH claims the facility was closed for budgetary reasons and because it was not performing adequate scholarship, others cited a strong citizen and local government opposition to the facility. Local government had passed resolutions asking that the facility be closed out of concern for the health effects of releases of tritiated water and tritium gas. In this instance, tritium was being produced for the benefits it provided researchers.

Just what associations people have with tritium will need to be the subject of future research. But the BNL case and the Lawrence-Berkeley case suggest that tritium has entered the vocabulary of people active in radiation controversies. At this point it is unclear just what effect this may have for future controversies.

Chapter 6. Conclusions

Trust as a dimension of risk

The tritium controversy of 1997 at Brookhaven National Lab is a rich case study for scholars interested in risk conflicts and for citizens, activists, and lab staff who are interested in how to prevent or avoid controversies or to resolve them more favorably the next time around.

This report has focused on the way that individuals who became engaged in this controversy came to develop perceptions of the risk posed by the tritium in the groundwater. We learned that people's risk perceptions were truly multidimensional. Human health and ecosystem quality were of interest.

However, the most salient dimension of risk for this controversy was the public's lack of trust in the Lab. To a large extent this controversy centered around the relationship between the Lab and the local population. A host of factors including: a lack of knowledge about the Lab, media stories and hyped concern, activists who captured public attention, poor public relations on the part of Lab leadership early on in the event, and host of past and present environmental contamination events caused by the Lab all led to a situation where the local people came to suspect the worst of the Lab.

Perceptions of risk from the tritium were never merely about the tritium alone. They also included fear or concerns that tritium was not the only radioactive contaminant that the Lab had lost sight of. If the Lab could be so careless with tritium, what else was sitting out there just waiting to be discovered? People's risk perceptions about the tritium in the groundwater came to include perceptions of the Lab's competence and the Lab's interest in protecting the local community.

It is doubtful that the public trusted the Lab before the tritium or the chemical contamination was found. Over and over and over again, people told us that no one knew anything about the Lab. It was a big secret that no one minded, until there came a reason to become concerned. But a situation of benign neglect became damaging to the Lab when members of the local population—not just activists, but citizens and civic leaders—came to be critical of the Lab. At the very least, people became concerned that the Lab was acting incompetently and was uncaring. Reasons offered as to why this was so ranged from poor management and poor oversight to sheer indifference to the environment and surrounding population on the part of Lab personnel.

Scholars have identified four key dimensions of trust. These are: competence, commitment, caring, and predictability (Kasperson, Golding, Tuler 1992). In the first half of 1997, when the tritium controversy was at its worst, citizens, activists, and civic leaders felt that the Lab was not exhibiting any of these characteristics. The public perception of competence of the Lab was affected by the announcement of the contamination and the realization that the Lab never thought to investigate whether the spent fuel pool was leaking. Suspicions of incompetence were later confirmed when DOE fired the Lab contractor. The commitment of the

Lab to protecting the safety of employees and the environment was challenged when the public became aware of the Tiger Team report that concluded the Lab put science before safety. People came to question whether the Lab cared about the surrounding community when they heard Lab management say they were not at all surprised to hear the spent fuel pool was leaking for the last 15 years and nothing was ever done about it. Finally, the public was unable to see predictability in the Lab's action, partly because the event seemed out of control, but also because the Lab went through many changes in leadership and because DOE exerted its own control over the Lab's actions.

This case study suggests that one additional dimension should be added to this depiction of trust—openness to sharing information. Our interviewees from the Community Residents Network and the Long Island Activists Network frequently claimed that BNL was not being open about sharing information. This lack of openness was perceived as an attempt to disguise past failures or to cover up inappropriate behavior. One community resident told the story of how surprised and angry a BNL employee became when he revealed that he had obtained a copy of the Tiger Team report (which had found many problems with environmental and safety protection at the Lab in the 1980s). He recounted how this BNL employee remarked with worry and amazement, “Where did you get *that*? How did you get that?” as if the report was something BNL had been attempting to keep buried.

Distributing information freely and openly is still an issue between Long Island Activists and the Lab. At a CAC meeting I attended during the course of this research the Lab was making available a new report about environmental performance. A Lab manager presented to the CAC the highlights of the report, but refused to distribute the report until the end of the meeting, despite requests from several CAC members to see the report during the presentation. I interviewed a member of the CAC later—a member of the Long Island Activist Network—who cited that experience as a sign that the Lab still has problems with sharing information. “It’s like pulling teeth to get anything out of them,” this person remarked. Based on this case study, it can be concluded that reluctance to share information can enhance the perception that the institution is not being trustworthy.

Associated with the topic of trust is the notion of independent validation. An important issue in this case study was the validity of information. One anecdote from an interview with a community resident captures this point well. This individual felt strongly that while the data from the Lab was essential to forming a sound judgment about the seriousness of the risk, nothing given by the Lab should be trusted without first being independently verified. Community residents active in the controversy attempted to verify Lab data and conclusions in two ways. First, they asked other governmental agencies to perform independent testing. For example, water samples were split and given to the Suffolk County Water Authority for independent assessment. BNL performed its own analysis on the sister samples. The samples were distributed to the two labs in a blind manner. Only the residents had the key that showed which sample was which so that the results could be compared. This certainly does not represent a relationship of trust. Perhaps it is better described as “trust but verify.” The second way in which people attempted to validate the Lab's assertions was to examine them for consistency and reasonableness. For example, an individual recounted how he studied BNL reports about the source of the chemical contamination. BNL sought to blame the contamination on an industrial

park to the south of the Lab. This individual laughed when he found that, to pin the blame on this industrial park, BNL had to make the assumption that the chemical plume migrated in the opposite direction of the groundwater flow, a notion he found completely illogical. Later on, of course, BNL admitted it was the main source of the plume.

With time local citizens came to accept the Lab as a trustworthy neighbor and their perceptions of the risk were diminished. First, there was a period of atonement, where the firing of the Lab's operator and the hiring of a new operator and a new director indicated to citizens that BNL had been doing something wrong, and that the DOE had acted to solve the problem. Also, BNL leadership apologized to the community for its mistakes. Second, predictability became higher when no new controversies arose. The tritium seems to have been where it was thought to be, the pumping and recharge seem to be keeping it there, and nothing new was going wrong. This gave people the sense that the problem was contained to just the tritium. Third, and most important for the establishment of trust, was that individuals came to believe that BNL did care about the environment and the local population. There were several reasons why this came about. First, BNL admitted the mistake, took responsibility for it, and took actions to mitigate it. Second, the Lab took the time and effort to listen to the public. And the people at the Lab listening were at the highest levels. Not only that, but people felt that the Lab heard what they said and that the Lab changed its behavior in response to the input it received. Third, were the personal relationships that Lab employees formed with the involved public. Through face-to-face contact, citizens came to know individuals working at the Lab. They felt comfortable about telephoning and asking for information or explanations. When answers were forthcoming and honest, people felt positive about the relationship.

In summary, peoples' perceptions of risk in this controversy were tightly linked to their assessments of how much trust they could put in BNL and the DOE. On the four key dimensions of trust—commitment, competence, caring, and prediction—the Lab fared poorly in many eyes. In addition to these we recognize that an openness to sharing and examining information is another dimension of trust. Finally, as the controversy ensued and people realized a need to work together, the principle of interaction with the Lab came to be “trust but verify.”

How social networks shape risk perceptions

One finding from this study is that not all social networks influence the formation of individuals' risk perceptions in the same manner. People in the Friends of BNL Network generally adopted the perception that the risk was acceptable whereas people in the Long Island Activist Network generally saw the risk as unacceptable. And in these two different perceptions different dimensions of risk were emphasized quite differently. Despite these substantive differences it is possible to draw some basic conclusions about the ways in which networks operate to shape individuals' risk perceptions.

Belonging to a network shapes risk perceptions in two main ways. First, the network serves as a means to distribute and interpret information. The network provides means for information to be made available to all members of the network. Specific individuals in the network assume communal responsibilities such as anticipating the knowledge needs and

interests of the other network members. They then take actions to ensure that people in the network receive the relevant information. They photocopy reports. They pass along notices of meetings. They clip newspaper articles. And so on. This was especially noticeable in the Friends of BNL Network where individuals were formally assigned this role, but it also seemed to hold true for the Long Island Activist Network where STAR took on the information gathering and distribution role. This role was least formalized in the Community Residents Network, which was also the network with the lowest degree of uniformity.¹⁶ Some community residents were more inclined to trust the Lab, others to trust the activists. As a result, information sharing within that network tended to be more discontinuous and based on friendships.

Second, because the members of the network share a number of premises, the interpretation and evaluation of information can be definitive. This means that uncertainties about how to interpret information are often resolved by ideological forces. Thus, the Long Island Activist Network would tend to assert a precautionary interpretation of the data (guilty until proven innocent) while the Friends of BNL Network would adopt an innocent until proven guilty presumption. This is definitive because it leaves little or not room for uncertainty or indeterminateness. Only in the Community Residents Network was there a greater degree of uncertainty of multiple interpretations of data. For individuals in networks that were highly structured and which emphasized ideological or philosophical beliefs (such as “science is good” for the BNL Network and “the precautionary principle” for the Activist Network), the network provided clear and precise interpretations of data. Members of these networks might not even be aware that there are different ways to interpret the data.

Third and finally, people use peer relationships in networks to “try out” explanations and interpretations that they may be considering believing. This was especially true for individuals in the Community Residents Network who asserted that they approached the controversy with an open mind. These individuals wanted to reach conclusions based on the most convincing argumentation, not on philosophical or ideological grounds. The diversity of opinion within this network was actually an asset for members who sought to explore these multiple interpretations. The same may be true for the Friends of BNL Network or the Long Island Activists Network. For example, an employee at the lab might let drop to a colleague a number of different notions associated with the risk perception. For example, imagine this hypothetical statement made by one Lab employee to another:

Boy the Lab sure has gone overboard with drilling monitoring wells.

Such a statement might inspire a variety of responses from:

- a) What’s the matter with you? Don’t you know the Lab is doing the right thing here?
- b) And how! Why is the Lab kowtowing to those crazy activists?

¹⁶ It may be true that within the Friends of BNL Network there was more discontent and discord than we were able to discern in this case study. We have already admitted the difficulties of getting the National Weather Service employees to speak with us. It could well be that, among certain segments of Lab employees, there was a great deal of difference about risk perception.

c) Why do you think so? I was wondering the same thing.

The first reply would serve to stifle dissent within the network and condemn people who dare to entertain a point of view in opposition to the one sanctioned by Lab leadership. The second response might indicate the presence of sub-culture within the Lab who takes issue with the Lab leadership. The third response might signify to the original speaker the rightness of entertaining critical thoughts and encourage further exploration.

In sampling peer attitudes, the hypothetical employee above is investigating the social consensus within the network. Certainly not everyone in a network needs to believe the same thing. There is some degree of tolerance for different beliefs and members of the network try to identify the boundaries of what beliefs are considered acceptable. At the same time, the network serves to reinforce some beliefs. At times in the controversy it might be more or less important for the network to be unified. For example, consider the effect this answer might have on the person who posed the first question above:

We've got to drill these wells in order to understand the exact location of the tritium in the groundwater. Otherwise we'll look really stupid to the community.

Such an answer would, of course, indicate to the first employee that the “correct” stance for people in this network is to support the well drilling program. It brings people’s beliefs into alignment and defines a clear position for the network. While the above example is purely hypothetical and we have situated it in the Friends of BNL network as a means of example, the same could be true for the other networks as well.

People in very tight social networks may find it difficult to adopt risk perceptions that are different or in tension with the network’s perceptions. For instance, we would expect it to be much more difficult for a BNL physicist to adopt a perception of the tritium risk more in line with the Long Island Activist network, and vice versa. For one thing, their colleagues would ridicule or ostracize them for “defecting to the enemy.” However, in a looser network, such as the Community Residents network, there is more latitude for diversity. We found this to be so in this case. Some community residents were very understanding and trustful of the Lab, others are, to this day, still resentful and distrusting. What makes this possible is simply that the Community Residents network is not as tightly coupled as the other networks are. The people who disagree with each other in the Community Residents network rarely have to interact. Therefore they can tolerate different perceptions more readily than a group whose survival depends on consensus—at least consensus on fundamental principles.

A possible hypothesis emerging from this research then is that people who are tightly linked to a high solidary network are more likely to form risk perceptions that are consistent with most others in the network.

Another interesting question to ponder is: Are the risk perception factors outlined in the Boxes 4-1, 4-2, and 4-3 determined by the network and imposed upon the participants of that network? Or do people who think alike join the same network? Reflection leads me to suggest it is a bit of both. People who think alike do join similar organizations. But it is also true that people with different views, if those views are not strongly held, can develop a

consistent rationality through communicative interaction. Members of the network learn from each other and, over time, come to adopt as their own rationality. New people who are attracted by the network are quick to learn this rationality. Thus, it is likely that, at least some networks pressure individuals to conform with the accepted style of thinking. Of course, some networks will be more tolerant of dissent and diverse points of view than will others. The extent to which the network demands conformity may be related to the decision stakes involved.

This suggests a second hypothesis. When the decision stakes are high, social networks organized around the controversy will demand higher conformity from their members.

Standards and stigma in risk perceptions

A third hypothesis to emerge from this research is that, if BNL had been able to say there was a “safe” level of radiation exposure (a “no adverse effect level” or NOAEL), and if they had succeeded in getting the public to accept this level as safe, the controversy would have been much lessened.

Results from this case study suggest that we would find this hypothesis to be untrue. In this instance, the controversy did not revolve around the safety dimension of risk alone. Instead, the trust dimension of risk became salient along with other dimensions such as the connection between nuclear weapons and nuclear research. These would have remained the salient dimensions regardless of whether or not the tritium was considered “safe” or not.

Opponents to the Lab frequently noted that, although the tritium contamination was small, no level of radiation pollution was acceptable to the public. This is obviously because the public stigmatizes radiation as inherently dangerous. This opinion is supported by scientists such as Helen Caldicott and Jay Gould and others who argue there is a scientific basis for this position. It is not clear that the controversy about the low dose effects of radiation is a purely scientific question, but, as long as controversy persists among reputed scientists, the controversy will remain alive in the public sphere.

Stigma in the sense of a community image blighted with negativity probably never came widely into play in the tritium controversy at BNL. In general, the public opinion about BNL is positive. People are generally proud to have the Lab and its renown scientists as neighbors. A survey of the population of Suffolk County would probably reveal BNL is held in a positive light. Stigma was certainly relevant to some of the Long Island Activists involved in this event. For them, and for a number of people in the general population as well, nuclear reactors are associated with negative images. Once the HFBR was shut down for good, most of the stigma associated with this case also disappeared.

Final conclusions

This exploratory case study investigated the ways in which people's situatedness in social networks helped shape their perceptions of a low dose radiation risk. It also explored how this particular risk controversy played out and the role that scientific information, regulatory standards, and stigma played.

The results suggest that social networks do affect the way an individual forms risk perceptions. Such networks provide means for information to be distributed and interpreted for the members of the network. They also provide opportunities for people to test out rationales about the risk and about the controversy through a process of informal "peer review." In this instance, regulatory standards were used by some parties to try and establish some "hard ground" where risk perceptions could take root. However, for many participants in this controversy such risk comparisons were irrelevant or ancillary because the most salient risk dimensions had to do with institutional trust and philosophical principles (against lying and for honesty and openness, and against the nuclear weapons culture). Thus this research suggests the hypothesis that in instances where damage is not the most salient risk dimension, changes in regulatory standards will have no effect on people's risk perceptions.

Acknowledgement of Support and Disclaimer

I would like to recognize the help received from two research assistants on this project: Jasmine Tanguay (doctoral student in the Department of Geography, Clark University, Worcester Massachusetts), and Jennifer Wilhoit (doctoral student in the Department of Environmental Studies at Antioch New England Graduate School, Keene, New Hampshire). As usual, I also benefited tremendously from the participation of Seth Tuler in this project. He not only helped complete some of the field work when we were in a pinch, but our numerous conversations about this case and the Fernald case were influential in the analysis of the data and the composition of this report.

This report was prepared by the Social and Environmental Research Institute for Decision Research (Eugene, Oregon) under subcontract. Decision Research was supported by funding from the U.S. Department of Energy, Low Dose Radiation Research Program, Office of Biological and Environmental Research, Office of Science, under Cooperative Agreement Number DE-FC07-99ER63879 with Decision Science Research Institute. Any opinions, findings, and conclusions or recommendations expressed in this report are those of the authors and do not necessarily reflect the views of the U.S. Department of Energy.

Bibliography

- Anonymous. No date. The type B investigation of the March 31, 1994 fire and contamination at the TRISTAN experiment, high flux beam reactor. (Brookhaven National Laboratory: Upton NY).
- Anonymous 1997a. HFBR Roundtable Workshops. Outline agenda for meeting on 9/26/97. 3pp.
- Anonymous. 1989. Tiger Teams. *Science* 19 April 1991: 366-368.
- Aron, Joan. 1997. *Licensed to kill: The Nuclear Regulatory Commissions and the Shoreham Power Plant*. Pittsburgh: University of Pittsburgh Press.
- Crease, Robert P. 1999. *Making physics: A biography of Brookhaven National Laboratory, 1946-1972*. Chicago: University of Chicago Press.
- D'Ascoli, Jeanne. 1997. Letter to Connie Kepert. October 7, 1997.
- Goldis, P.D. 1989. Questions and answers about Tiger Teams. *EDPACS, the EDP Audit, Control and Security Newsletter*. Vol. 27, Nr. 4. pp.1-10. (October 1989).
- Grossman, Karl. 1997. Another Leak at Lab Revealed. *The East Hampton Star*. July 31, 1997.
- Kasperson, Roger, Dominic Golding, and Seth Tuler. 1992. Siting hazardous facilities and communicating risks under conditions of high social mistrust. *Journal of Social Issues* 48(4): 161-187.
- U.S. DOE. 1997a. Information session brochure. October 6, 1997.
- U.S.D.O.E. 1997b. *Interim report on the Office of Environment, Safety, and Health oversight of groundwater tritium plume recovery activities at the Brookhaven National Laboratory*. February 1997. Washington DC: Office of Oversight Environment, Safety, Health, USDOE.
- U.S. D.O.E. 1997c. *Integrated Safety Management Evaluation of the Brookhaven National Laboratory*. Department of Energy Office of Oversight Environment, Safety and Health. April 1997.
- US General Accounting Office. November 1997. Department of Energy. *Information on the tritium leak and the contractor dismissal at the Brookhaven National Laboratory*. GAO/RCED-98-26 Department of Energy.
- United States Environmental Protection Agency. 2000. National Primary Drinking Water Regulations; Radionuclides; Notice of Data Availability; Proposed Rule. *Federal Register* April 21, 2000. Volume 65, Number 78, pp. 21575-21628.
- Withgott, Jay. 2001. "Tritium lab to close after loss of NIH funds." *Science* 294:977-978.

Appendix A. Interview Guide

Interview guide

1. Tell us, briefly, **what happened** in the event.
 - Can you highlight some of what were for you the key points in the history of this event?
The purpose here is to bring the person's mindset back to the issue. We are not necessarily seeking information at this stage, but we won't ignore new information, obviously. Keep this discussion short!
2. As far as you are concerned, **what was this controversy about?**
 - Probes
 - *Risk and danger*
 - *Trust and mistrust*
 - *Moral opposition to nuclear reactors*
3. What **other issues** do you care about? Where does this one fall in terms of its importance to you given all the things you care about?
4. Talk a little bit about **your take on this event**.
 - What do you think about the health risks? (*their risk perceptions*)
 - What kind of images do you have of the facility?
 - How do you view the officials at the Lab?
 - What is your solution to the problem?
 - What outcomes would you like to see?
 - What do you think of the process?
 - Do you think there is anything the officials can do about anything at all or are their hands tied?
 - **What information and events were important in shaping your views?**
If they mention trust:
 - Is trust an issue because there is no satisfactory way to discuss the risks?
5. What opportunities did you have to discuss this event with other people? **Can you tell us about the kinds of places or venues where you had interaction with other people about this event?**
The goal here is to get a list of the discourse spaces.
Probes:
 - Do you belong to any civic organizations where this was discussed?
 - Did you talk about it with neighbors?
 - Did you talk about it with close friends? If so, in what settings?

- Did you attend any meetings or presentations where Lab employees talked about the event?
- Did you read about it in the newspaper? On television or radio?

Activity

On this sheet of paper, draw a figure, a diagram, or a map, if you will, of the different settings or venues in which you discussed or learned about this event with other people. They don't need to be arranged geographically, unless you choose to.

Make certain to put their name on this sheet of paper.

6. Now we would like to talk about **what the quality of the discussion was like in these different venues**. What were these different venues for discussion like?

- Describe the kinds of people you might talk face-to-face with about this.
- How did conversation unfold in these settings?

Ask about each one individually

- Did you have a chance to talk?
- Did you have the sense that people listened?
- How would you characterize the conversation (dialogue, interaction, discussion) there?
- Were you able to get a sense of what other people in the community are feeling?
- How do you get a sense for how people at the Lab are feeling?

7. Now we want to discuss **the way that information was brought into these settings**. What are the different sources you draw upon to gain knowledge about the risk, safety, and health issues related to the event?

- What sources did you rely on for factual information?
- Are there particularly important sources of information that you rely on (people, reports, etc.)? How would you rate these various sources? (good, bad?; some sources better for some issues and not so good on other issues?)
- What happens for you when there is an overt conflict in opinions between one source and another, or between one group and another (e.g., local environmentalists and the facility managers)?

8. Do you know of any **standards** that are relevant to the allowable levels of risk (contamination, exposure) from this event?

- Do you think that the standards are too high? Too low? For an adequate level of protection?
- How well do the experts and scientists at the facility understand the risks to the community? How do you view science as a source for making management decisions about the event?

- How do other people in the community view science as a source for making management decisions about the event?
 - If science is not enough, what other standards and values ought to apply?
9. Is there anything **unique about this region** that we need to know about in order to understand why this event unfolded in the manner that it did?
- History of previous controversies
 - Culture of behavior
 - Personal animosities among people
 - What has been the role of the facility/lab in the community? (e.g., primary employer, “good neighbor”, a mystery)
10. Now we’d like you to reflect on how your **opinions about the event changed over time**. *This needs to link back to question 2 (what is this controversy about)*
- What is your opinion right now about this event?
- Probes:*
- Do you feel it was a serious danger to human health?*
- Do you feel that the Lab was honest about the dangers associated with the event?*
- Do you feel that people were concerned about health risks or something else?*
- What were some of the more important things that shaped the way you feel about this risk?
 - What are the key factors that have influenced your opinions about what is good and bad, acceptable and unacceptable with regard to the event?
 - Can you point to any significant changes in your opinion?
 - How would you describe how other people in the community – not Lab employees – generally interpret this event?
 - Does this differ from how Lab employees interpret the danger associated with this the event?
 - How have views, opinions regarding the event in the community changed over time?
 - **Why do other people in the community care about this? Or not?**