CRUDE CONSERVATION:

NATURE, POLLUTION, AND TECHNOLOGY

AT STANDARD OIL'S NEW JERSEY REFINERIES, 1870-2000

by

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ABSTRACT OF THE DISSERTATION

Crude Conservation:

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"Crude Conservation: Nature, Pollution, and Technology at Standard Oil's New Jersey Refineries, 1870-2000" investigates the complex environmental and technological histories of petroleum refining. I explore how two of Standard Oil's refineries—located in Bayonne and Linden, New Jersey, each operating for over one hundred years—contributed significantly to the social changes wrought by oil. Since the late nineteenth century, oil has profoundly altered almost all aspects of modern American life. However, many Americans are insulated from direct exposure to the negative consequences of its use, such as environmental degradation and climate change. Oil refining itself is often overlooked in a growing literature on the history of energy, yet refineries are central to transforming crude oil into petroleum products.

Refineries and processes of material transformation are significant in exploring oil's social and environmental consequences. I examine Standard Oil of New Jersey's history pollution, its refinery conservation methods, and its public relations rhetoric of scientific, technological, and environmental expertise. I argue the company constructed a reputation for expertise that allowed it to join and ultimately shape debates over what to do about oil pollution. Standard Oil of New Jersey worked hard to convince Americans that it was not creating, but rather solving, environmental problems.

Dedication

For my parents, Greig and Kathleen Lutz, with love

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INTRODUCTION

"Crude Conservation:
Nature, Pollution, and Technology
At Standard Oil's New Jersey Refineries, 1870s-1980s"

On Saturday, February 12, 1881 at around 6:40 a.m., a loud booming noise reverberated across the city of Bayonne, New Jersey. The noise resounded so loudly that it shook windows and frightened residents in the city of Elizabeth several miles southeast across Newark Bay. The cause of the explosion was an accidental fire at the Standard Oil refinery located on Constable Hook in Bayonne. At the time, the oil refinery was the world's largest and was a main source of kerosene production for the East Coast as well as Europe. That morning, 9,000 barrels of distilled petroleum—crude oil that had gone through at least a few steps of the refining process—caught fire, causing $4,000 of damage, the equivalent of nearly $104,000 today.[1] The explosion was so powerful that it blasted through the sides of a holding tank made of quarter-inch thick iron. Locals even mistook the blasting sound for someone shooting off a large cannon at Governor's Island, located five miles northeast, near the southern end of Manhattan.[2]

Though the explosion was impressive, it was almost routine for oil explosions to rattle windows and startle nearby residents. In the *Bayonne Herald*, an article described the explosion as just "another blaze at the works of the Standard Oil Company." This casual response could be an apathetic take on the well-understood danger of living near oil refineries. In the late nineteenth century, oil refineries were

considered by many local people to be a nuisance and a danger to public health. In fact, opposition to refineries in late-nineteenth-century metropolitan New York relied on the negative environmental consequences associated with refining practices, such as oil pollution in the water, smoke and smells in the air, and the possibility of dangerous explosions and fires that could spread to nearby buildings.

However, the response to the explosion also demonstrates the Standard Oil Company's familiarity in dealing with such unpredictable and potentially catastrophic events. "At the first note of alarm the Standard Fire Department commenced work and in a few minutes there were three streams of water directed against the flames," the *Bayonne Herald* described the scene. Even though the fire was massive, the Standard Oil Fire Department was able to get things under control, and quickly. Firemen "used all the necessary precautions to prevent the flames from communicating with surrounding property." With attentive firemen at the ready, Standard Oil Company workers were able to drain and save some of the oil in the tank, and the fire burnt itself out around 1:00 p.m. that same afternoon without spreading to any other structures. The Standard Oil Fire Department did not even call for aid in addressing the fire from Bayonne's local Hope Hook and Ladder Co., No. 2.[3]

This event reveals the main tension in "Crude Conservation." In this dissertation, I examine the historical relationship between the negative environmental consequences of oil refining and Standard Oil of New Jersey's responses to those problems. For example, though the explosion of February 12, 1881 was powerful, Standard Oil's response was portrayed in the local newspapers as expertise. The tone

of the *Bayonne Herald* article isn't one of anger at the potential danger of a massive explosion in Bayonne or of apathy toward the frequency of such events, but rather one of respect for the company's ability to respond to and control the fire. Perhaps in an effort to assure readers, it details Standard Oil's expert training and readiness for unexpected fires at the refinery. The article describes, "The employees of the Standard Oil Company are drilled for service in case of fire, and as they have all the necessary appurtenances, steam pumps, &c., their services, except in extreme cases, are all that is necessary."[4] Here, in the face of a potentially catastrophic explosion, Standard Oil handled the situation with aplomb.

Throughout its long history, Standard Oil of New Jersey (SONJ) cultivated a position of expertise in scientific and technological issues related to oil refining.[5] My discussion of SONJ's expertise relies on a definition offered by science and technology studies scholar Gwen Ottinger. She describes expertise as existing in a cultural space where scientists create borders between what they decide is science and non-science. Doing so creates the authority on which the cultural hierarchies that classify different types of knowledge are based. Expertise is also a historically contingent concept, fashioned and refashioned by officials, corporations, and technically-trained individuals on an as-needed basis. The dissertation seeks to answer several questions about oil refineries, pollution, science, technology, and expertise. It asks how oil refineries interact with their local environment. How did local people unaffiliated with the oil industry perceive this relationship? In what ways did their perspectives differ from that of the oil industry? What enabled SONJ to cultivate a reputation for scientific and technological expertise? How did it use this

expertise in public discussion about oil pollution? And did these arguments change over time?

In "Crude Conservation," I explore how SONJ employed its reputation for expertise to respond to environmental issues regarding petroleum refining from the late nineteenth century to the end of the twentieth.[6] Throughout the twentieth century, SONJ worked hard to demonstrate that the company's scientific and technical authority enabled them to have the most appropriate and authoritative responses to oil pollution. Ultimately, I argue, SONJ used its scientific and technological expertise to be active participants who shaped the outcomes of debates over the environmental effects of oil refining. It did so by crafting a reputation for expertise in scientific and technological knowledge in company publications and public relations efforts. Often, that expertise was real and based on the legitimacy of corporate scientists and engineers, but just as often that expertise was exploited to shape public understandings of environmental issues. Expertise enabled Standard Oil to consistently argue that the environmental problems associated with oil's use were preferable to discontinuing the use of oil altogether. Moreover, the company asserted that their own scientists and engineers were hard at work making oil refining a more environmentally friendly industry.

The term "crude conservation" refers to the company's adoption of industrial conservation practices in response to critiques about oil pollution in the early 1920s. Embracing Progressive Era techniques for increasing efficiency and reducing wastes was one way that SONJ approached environmental problems. Crude conservation practices literally helped refineries save crude oil and remove much of the oil

pollution from the waste stream. However, crude conservation practices have also served to blind the oil industry and the public from the fact that, after nearly one hundred years, refiners have not been able to eliminate pollution completely from oil refining processes. Though contemporary refinery technologies are anything but crude, oil refining—and the consumption of petroleum products that it enables—have made crude changes to local, regional, and global landscapes and threaten to disrupt Earth's climate.

Conscious of historians' global narratives about oil's influence, this project revolves specifically around the environmental and technological histories of two of Standard Oil of New Jersey's refineries. One, discussed above, is the Bayonne refinery, originally constructed by the Prentice Refining Company in 1872 and purchased in 1877 by Standard Oil. The other is the Bayway Refinery in Linden, New Jersey, constructed by Standard Oil and opened in 1909. Both refineries were the jewels of Standard Oil's early refining empire, and the company owned and operated both for the majority of the twentieth century. The two refineries are also notable because of the documented legacy of environmental degradation they have created. In 2004, the New Jersey Department of Environmental Protection brought a civil suit against the ExxonMobil Corporation (formerly Standard Oil of New Jersey), asking for $8.9 billion to address over one hundred years of "staggering and unprecedented" pollution from the Bayonne and Bayway refineries.[7]

These two refineries are significant for several reasons. First, Standard Oil of New Jersey has historically been and continues to be one of the largest and most profitable oil corporations, and they owned and operated these two refineries for over

a century. Secondly, because the refineries were managed over such a long period, I am able to investigate their role in social, economic, and technological changes over time. Lastly, their location in the heart of the New York metropolitan region reveals the inextricability of oil refineries and the changes they wrought on the landscapes from the heart of American business and culture. It is easier to shrug off environmental change in less-populated regions, but oil refineries' ability to shape the landscape of the nation's most significant city demonstrates the need to wrestle with oil refining's environmental history. In addition, New Jersey presents a unique case study for the history of oil. While the state does not have any significant crude oil resources and has not been a site of petroleum extraction, it has an important and understudied role in the history of oil due to its role as an oil-refining center.

Focusing on these two refineries also allows me to address historiographical gaps in the scholarship on New Jersey. A recent edited collection on the state's history demonstrates the lack of attention historians have given to New Jersey overall.[8] Of all the states, new publications on New Jersey's history are written most infrequently, with only one general history of the state published since 1977.[9] Most of this scholarship relates to New Jersey's colonial and revolutionary history.[10] There are few histories of New Jersey that address the period after 1945.[11] "Crude Conservation" fills this historiographical gap by investigating the state's environmental history through the Bayway and Bayonne refineries.

Focusing on polluted places in New Jersey might seem like a cliché, but doing so gives us access to the complexities of the state's environmental history. Stereotypical cultural depictions of New Jersey often evoke the toxic smells on the

turnpike, industrialized landscapes, and other examples of environmental pollution.[12] In fact, some of those stereotypes were created by environmental accidents at the Bayway and Bayonne refineries. During the 1980s, local newspapers chronicled periodic escapes of petrochemicals into the air, settling on or near the New Jersey Turnpike, which became the most persistent reminder of the state's oil refining industry. While these are most assuredly not the only landscapes New Jersey has to offer, the magnitude of the state's pollution is staggering.[13] As the state with the highest number of Superfund sites and over 23,000 active brownfield sites with confirmed contamination, New Jersey is one of the most polluted states in the country.[14] Yet, many of New Jersey's toxic landscapes have not been investigated along historical and environmental lines of analysis. As Neil Maher asserts in his introduction to an interdisciplinary collection of articles on New Jersey, "Currently, there is a dearth of literature examining New Jersey's environments."[15] This is still the case since the publication of that edited collection in 2006. Nearly a decade has passed, and there is little progress on the state's toxic history.[16] "Crude Conservation" rectifies that gap and expands the written work on New Jersey's toxic places.

This project also contributes to energy and environmental histories more broadly. "Crude Conservation" is ideologically rooted in questions raised by historian Karen Merrill in her article "The Risks of Dead Reckoning: A Postscript on Oil, Climate Change and Political Time" from a 2012 special issue of the *Journal of American History*, in which environmental and energy historians (among others) took aim at the current state of petroleum historiography. In her article, Merrill asks what kinds of histories will be most useful for the future. If scientists' direct warnings

about the risks of climate change are to be believed, Earth's temperature is likely to rise 1 to 3 degrees by 2050. Almost as an indication of our progress towards that result, the year 2017 was one of the three warmest years on record, and scientists have recorded the top nine since 2005.[17] What will people need to know about oil's history while grappling with the realities of climate change? "We will have to understand the lack of political will, domestically and internationally," Merrill asserts, in order to understand the history of climate change.[18] Will any histories of oil be more necessary than those that deal directly with her question? How did we get here and how can we untangle the world from petroleum? She continues, "What can historians do now to lay the groundwork for those histories?"[19] "Crude Conservation" aids in the scholarly work trying to answer these questions. How did oil become so entwined with modern life that removing it, even in the face of climate change, became incomprehensible?

Petroleum's persistent environmental legacy is profound. While climate change is the contemporary focus of environmental concerns about oil, in the past, lots of smaller and localized incidents of pollution implicated oil refineries as the source of environmental degradation. We need to understand oil refining's histories of pollution as a part of the pattern of how SONJ's has approached and exploited multiple environmental systems. Climate change is especially dangerous, but we can better understand how we got to this point by analyzing SONJ's environmental politics more broadly. This project focuses on oil refineries to draw attention to their role as indicators of petroleum's environmental legacy.[20]

Oil refining is often overlooked in a growing literature on the history of energy, yet refineries are the sites of the material transformation of crude oil into refined petroleum products. Some of the recent literature on oil in the United States examines the implications of the oil industry and its all-encompassing role in creating a consumer society. These authors argue that oil has become an underappreciated and often-ignored facilitator of consumer life.[21] Oil has enabled Americans to imagine, live, and feel an inherent power over the materiality and geographies of their everyday lives—power that is disconnected from the environmental consequences of their consumption. Other scholars are exploring the ways that industrialization, consumer society, and chemicals derived from fossil fuels are dispersed widely throughout the environment and how they affect human and non-human biological systems.[22] Simultaneously, the field of environmental justice examines the complex social consequences of industrial pollution.[23] Though much of this work does not address the oil industry specifically as a cause of pollution, oil is implicated across the broad spectrum of industrialization and petrochemical use.

If petroleum's environmental problems are so persistent and have affected millions of people, why do consumers continue to accept petroleum products? And if environmental pollution is just an engineering problem, why are refineries still polluting? Unquestionably, part of the answer to these questions lies in the materiality of petroleum. Hydrocarbon molecules are notoriously difficult to control during complex refining processes and in contamination scenarios. However, scholars have also theorized that Americans accept and overlook oil pollution because of the benefits oil brings. Stephanie LeMenager calls Americans' inability to collectively

react against oil's negative consequences a "strange transience," as the push to regulate the oil industry to protect environmental and public health often recedes quickly after an oil-related crisis.[24] This invisibility is a piece of why and how society has accepted petroleum.

While these arguments are compelling, most of these scholars focus entirely on the extraction of crude oil and consumption of oil products, and not on the processes of transformation that turn crude oil into consumable results. Studying refineries offers an opportunity to explore how this material transformation took place, as well as the social, environmental, and cultural consequences of refinery processes and oil industry initiatives.

With this project, I join scholars such as Hugh Gorman, Joseph Pratt, and Christopher Jones in engaging the in-between processes of petroleum production. For example, Christopher Jones's *Routes of Power* investigates energy transitions in the Mid-Atlantic, qualifying the social costs of technological change as networks of energy transportation and patterns of consumption reworked social relationships from the late nineteenth to the early twentieth century. Jones's assertion that understanding the physical infrastructure of energy is necessary to grapple with the mineral energy regime demonstrates how scholars can create useful histories for a future changed by fossil fuel use.[25]

In addition, Hugh S. Gorman's *Redefining Efficiency* can be considered the authoritative study of petroleum refining and pollution. Gorman asks how the oil industry changed its responses to concerns about pollution over time.[26] In answering this question, he traces such responses throughout the twentieth century and disproves

the notion that the oil industry was unconcerned with pollution before the environmental laws of the 1970s. In *Redefining Efficiency*, Gorman demonstrates that initial concerns about pollution were treated as engineering problems and inefficiencies in production, but the environmental ethics of the 1960s and 1970s replaced that characterization with a moral concern for pollution's effects on ecology and communities.[27]

Throughout this project, I have relied on Gorman's comprehensive research on the oil industry and, indeed, there are similarities between his work and my own. The key point of departure for my study is the focus on two individual refineries and one major corporation. I also diverge from Gorman's work by asserting that the oil industry's commitment to efficiency was due to an understanding that the petroleum fractions lost as wastes had the potential to become more valuable as technology invented new uses for them. Significantly, technological change reshaped SONJ's approaches to environmental problems. The development of the petrochemical industry influenced how SONJ approached pollution issues.

Lastly, the work of environmental historian Samuel Hays has influenced how I approach refinery conservation efforts in the twentieth century. Hays's *Conservation and the Gospel of Efficiency* challenged historians to see the conservation movement of the early twentieth century not as a "struggle against corporations." Instead, he argues that "conservation, above all, was a scientific movement, and its role in history arises from the implications of science and technology in modern society."[28] Conservation, Hays asserts, existed alongside the growth of mechanization and scientific management of corporations, and relied in

part on corporations' role in creating private sector experts in fields traditionally considered to be under the authority of local, state, and federal governments. As Hays argues, conservationism's "essence was rational planning to promote efficient development and use of all natural resources."[29] For conservationists, science and technology were the tools of the future, capable of creating prosperity.[30]

It became clear during my research that oil refineries had adopted principles similar to those in other conservationist fields, like forestry, that Hays originally outlined in his hallmark 1959 book. My research shows that between 1930 and 1960, refinery managers and workers at facilities like Bayonne and Bayway incorporated Progressive Era ideals of efficiency to reduce lost oil, lower costs, and lessen environmental pollution. Embracing science, technology, and efficiency was oil refiners' chosen path forward, and shaped how oil was used throughout the twentieth century.

"Crude Conservation" begins by exploring how pollution concerns were central to the early refining industry in metropolitan New York City. Environmental historians have investigated the growth of New York's metropolis and the changes made to the surrounding landscape. Chapter 1, "Oil in the Metropolis," builds on this work as it analyzes the growth of the oil refining industry in the New York metropolitan area, focusing on the Bayonne refinery in Bayonne, New Jersey, refineries along Newtown Creek in New York, and the Bayway refinery in Linden, New Jersey. This chapter looks closely at local newspaper articles and State Board of Health reports from New Jersey and New York, as well as magazine articles and reports from New York City officials, to uncover more complexity within the

interstate debates about oil pollution. “Oil in the Metropolis” diverges from previous scholarship by arguing that divisions within both New Jersey and New York over what to do about oil pollution hampered any effective regulations against oil refinery pollution.

Chapter 2, “Politics and Pollution at the Refineries, 1920-1960,” focuses on oil pollution and responses to it from local residents, legislators, SONJ, and other industry representatives. In the late 1910s and early 1920s, oil pollution became a national issue. As refineries increased production of petroleum products, specifically gasoline, they created more wastes than ever before. This chapter explores the public response to increased pollution during this period and examines SONJ’s reaction of employing a wide array of conservation practices at their refineries. In the debates over the Oil Pollution Act of 1924, the oil industry argued that eliminating oil pollution was impossible and would stifle their business. Though the act has been criticized for this weakness, it inspired the oil industry to reduce pollution on their terms. In the late 1920s, the oil industry, including SONJ, began instituting practices inspired by Progressive Era ideals of efficiency, scientific management, and technical expertise. This chapter argues that in adopting crude conservation practices, SONJ remade its approach to environmental issues.

Chapter 3 investigates how increased gasoline production and consumption reshaped the ways that people interacted with nature outside of the refineries. Specifically, “Petroleum’s Park” examines how the dedication to building roads for automobiles reshaped the regional landscape of New Jersey and New York, specifically analyzing the Palisades Interstate Park and its parkway. Environmental

historians have investigated how infrastructure projects like highways and pipelines facilitated both the production and consumption of petroleum products. With the construction of the Palisades Interstate Parkway, the consumption of gasoline shaped both the landscape itself and the cultural practices of exploring the natural beauty of the Palisades' cliffs. From the very beginning of the park's history, development at the Palisades relied on building roads specifically for cars. Philanthropists—most notably John D. Rockefeller Jr.—park authorities, and public planning officials all believed that the Palisades should contain a parkway specifically for leisurely drivers who could take in the scenery from the comfort of their cars. Over the course of the early twentieth century, they reshaped the Palisades into a motorist's paradise. This chapter argues that the park is better defined by its roads than by its cliffs.

Chapter 4 explores how SONJ's technological history, specifically its innovations in petrochemicals, shaped the company's responses to environmental issues in the second half of the twentieth century. Since the 1920s, SONJ crafted a reputation as a scientific and technological expert. This reputation was largely the result of the company's work in developing petrochemical technologies and advanced oil refinery processes. These innovations often meant making valuable products from what had previously been considered wastes or byproducts, using such projects to cultivate a reputation for scientific and technological expertise. As SONJ confronted increased criticism in the late 1960s through the 1980s, it returned to this expertise in marketing materials to argue that it was an expert not only in refining technologies but also in environmental issues more broadly. Exxon (as SONJ was renamed in 1973) worked to influence public opinion by claiming that environmental problems

had technical solutions that no one but the corporation itself was more qualified to provide. Chapter 4 argues that SONJ used expertise developed from petrochemicals research in an effort to convince the public that it was also an expert on environmental issues.

Chapter 5 asks, what and when did Exxon know about climate change and how did it use that knowledge? Recently discovered documents reveal that Exxon scientists at the Esso Research and Engineering facility in Linden, New Jersey conducted innovative experiments investigating climate change in the late 1970s and early 1980s. This chapter contextualizes these revelatory documents within Exxon's larger environmental history. It explores how Exxon's climate science programs enabled the company to gain a reputation for environmental expertise in scientific and governmental circles during the late 1970s and early 1980s. The chapter then considers how climate science programs at Exxon dramatically decreased in size and scope in the mid-1980s, and how by the 1990s, the company had shifted towards a public politics of climate change skepticism. Chapter 5 argues that Exxon used its reputation for scientific, environmental, and technological expertise to support its own claims against the legitimacy of climate science, even though its scientists had ironically been on the cutting edge of climate change research for years.

These chapters work together to uncover the complex ways that oil refining has influenced American history. Though I focus predominantly on documents relating to one company, just two refineries, and only a handful of environmental and technological issues, the implications from learning more about the social and cultural impacts of oil refining are significant. Oil refining remains the crucial step between

extraction and consumption of crude oil. If we are ever to fully grapple with humanity's dependence on petroleum as an energy source, it behooves us to learn more about the crucial role that oil refineries have played in the creation of our modern world.

CHAPTER 1

Oil in the Metropolis, 1870-1920

"The works now in course of construction at Constable Hook, are of far greater magnitude than many have any idea of," exclaimed an article from the Bayonne Herald on March 10, 1877.[1] Describing new expansions to the Prentice Oil Refinery, the writer exclaimed that they would bring "a new era for this city, and ere long it will rival in business importance many cities which consumed years in attaining a position but very little in advance of the young city of Bayonne."[2] In the nineteenth century, industrialization symbolized progress and many in Bayonne saw oil refinery's growth as a chance for the city to make its mark. Located adjacent to New York City on the western side of the Hudson River, Bayonne had slowly begun to attract commercial attention. "While the greater number of our citizens make their business headquarters in New York, this city is quietly and not slowly creeping upward as a commercial and manufacturing center," another article proclaimed, "and the day is not far distant when the people will realize that they are inhabitants of one of the liveliest cities in the State of New Jersey."[3]

The Bayonne refinery was "an enterprise of great dimensions."[4] It employed two hundred workers, each with specialized tasks in the production of refined petroleum products. Construction workers had just finished expansions to the refinery and it was scheduled to open in the spring of 1877. "Approaching the works from a distance," a *Bayonne Herald* article described the industrial scene, "the spectator might imagine he descried a colony of gasometers."[5] In fact, twenty-six iron oil tanks of varying sizes (the largest two held 16,000 barrels each) with the total capacity of

about 5.5 million gallons were the most prominent buildings at the refinery. In the twelve 600-barrel stills, crude oil was heated and separated into different fractions—the name that refiners used for the different molecular weights of oil's derivative products—like kerosene and thicker industrial oils. A 250-horsepower boiler house provided heat to the stills.[6] Standard Oil bought the Prentice Refinery that spring.

Just a few months later, in August of 1877, the *Bayonne Herald* reported an unusual story. A short article claimed that Tom Toumey, a Bayonne man known as "the great American well-digger," had struck oil on Constable Hook. According to the story, the discovery had sent Toumey into a flutter: "Visions of wealth are floating through his brain, and yesterday he wanted to purchase, for his private use, the pair of elegant horses which draw the La Tourette House Stage." Unfortunately, little came of Toumey's dreams of elegant carriage rides, since "those who know say that the oil was some which had escaped from one of the tanks of the Standard Company."[7] Reading the story one might assume the author was poking fun at Tom Toumey. It is possible that the author did not consider well-digging "great American work," and that Toumey should have known that the oil he found was not his to claim, but was simply leaked crude from nearby Standard Oil Company tanks. However, the author's surprise at Toumey's ignorance about the origins of the mysterious oil demonstrates a familiarity with oil pollution in Bayonne in the 1870s. Though refineries had existed on the Hook for only a few years, oil pollution was part of daily life for those living and working in Bayonne. That the discovery of an oil leak near the oil refineries was grounds for a local joke reveals the inescapable presence of the refinery within the local Bayonne community.

However excited Bayonne's citizens were to welcome the new industrial developments in their town, they were forced to accept the good along with the bad. Though the August 1877 article suggest an apathetic response to oil pollution, in reality, oil pollution problems had begun to plague the metropolitan region. In the late-nineteenth and early-twentieth centuries, the oil industry expanded refinery operations in New York. As the internal combustion engine became more popular, the country's demands for kerosene and then for gasoline required such growth. However, a consequence of this industrial expansion was the spread of petroleum refining's industrial wastes. In the 1870s and 1880s, oil refineries proliferated in New York's Newtown Creek and in Bayonne, New Jersey. As the region's oil refineries grew in scale and economic value, refinery wastes became inescapable for those living nearby. Most significantly, nineteenth-century refinery technologies created massive amounts of sludge acid—the thick sulfuric acid left behind after the oil was distilled. Sludge acid was the most noxious waste associated with nineteenth-century oil refineries. In 1883, inspectors found that the Bayonne refinery was responsible for producing nearly 3,500 barrels of sludge acid daily.[8] While some refiners, like Standard Oil, sold portions of the compound to fertilizer companies, much of it was simply disposed of in open pits on refinery property or in nearby waters. Once in water, however, the sludge acid reacted to produce foul stenches that wafted across metropolitan New York.

A battle over oil refining nuisances emerged in the late-nineteenth and early-twentieth century New York metropolitan area. As part of Progressive Era reforms, local people wrote to newspapers and government agencies and called on authorities

to protect them from oil refinery pollution. In their complaints they specifically labeled oil refinery pollution a "nuisance." Naming something a nuisance was not just a simple complaint, but also an important gesture with potential legal consequences. "Nuisances," historian Melanie Keichle asserts, was a term used broadly and covered anything that caused damages, injuries, or health concerns.[9] The public debate demonstrates the tensions between desires for economic growth and protection of public health. How did New Yorkers and New Jerseyans living and working nearby respond to the presence of oil refineries? How did local and state governments in New York and New Jersey respond to oil nuisances? And how did the industry, specifically Standard Oil, respond to these critiques?

Historians have analyzed the environmental history of nineteenth-century urban centers and described the specific role that pollution played in shaping city life.[10] In his study of New York's nineteenth-century refineries, historian Andrew Hurley argues that relocating from inside cities to their peripheries allowed corporations to leverage their economic power against local authorities.[11] Standard Oil's purchase of the Prentice Oil Company's Bayonne Refinery in 1877 and its construction of the Bayway Refinery in Linden, New Jersey in 1909 enabled the company to exist within New York harbor but outside of New York City's regulatory reach. Standard Oil's shift to New Jersey, Hurley argues, demonstrates how the company exploited divisions between authorities in New York and New Jersey in their attempts to prevent the regulation of oil industry effluents.[12]

Despite Hurley's argument that interstate politics were primarily to blame for the failures of pollution regulation, my research shows that intrastate arguments

between state and local governments, within both New York and New Jersey, are just as culpable. Governmental responses, particularly those between state and local officials, were mixed and often represented an inability to navigate the different responsibilities of fostering both public health and economic growth in the late-nineteenth and early-twentieth centuries. I argue that these divisions between authorities in New York and New Jersey over what to do about oil nuisances stymied effective preventative measures. For example, in defiance of the State Board of Health and the Governor's Office, Brooklyn's Board of Health refused to blame refineries for the nuisances. The ensuing debate over sludge acid thwarted legislation that would have made these nuisances illegal in New York State. There was also resistance to oil refineries in New Jersey. The New Jersey Board of Health, local New Jerseyans, and nearby by (yet out of state) residents on Staten Island's North Shore voiced their concerns throughout the late-nineteenth and early-twentieth centuries about Bayonne's oil refineries. New Jerseyans were no less able to ignore oil refinery pollution problems than New Yorkers, and their complaints to the New Jersey Board of Health forced officials to address the ways that oil pollution shaped their lives. However, in both states, refineries were not legally bound to make any changes to their operations in order to reduce wastes.

My case study of Standard Oil's Bayonne, Bayway, and Newtown Creek facilities presents a new way to examine stories of pollution and regulatory failure across the twentieth-century United States. Standard Oil's choice to focus refinery growth in the suburban borderlands adjacent to New York City reveals early efforts to make the negative consequences of oil refining less visible to the public.[13] Evidence

suggests that it was not just about thwarting regulations to the oil industry; increasing production at the company's New Jersey refineries was also about reducing the appearance of refinery pollution to the public. At the turn of the twentieth century, Standard Oil recognized the bad press it was getting in New York City and took steps to remove itself from the spotlight. Standard Oil's work to minimize public perception of oil refinery pollution set the foundation for the company's interactions with the public concerning environmental issues for the rest of the twentieth century.

This chapter begins by exploring how the Bayonne, Bayway, and Newtown Creek refineries came to be located in New York. Then, the chapter examines the consequences of oil refining in New York State and how authorities there dealt with complaints about stench nuisances from the Newtown Creek refineries. Investigations by the New York and New Jersey Boards of Health at the Bayonne refineries follow, and the chapter analyzes how New Jersey State authorities responded to similar complaints against the Bayonne refineries. Lastly, the chapter explores Standard Oil's response to these investigations in the first decade of the twentieth century.

Before Standard Oil set up shop in New York and New Jersey, geologic forces shaped the northeastern edge of New Jersey. Glaciers created an environment where fresh water was abundant, soils moveable, and marshes fillable, with a deep harbor leading to the ocean. When the Laurentide Ice Sheet began its final retreat about 20,000 years ago, during the late-Wisconsinan glaciation, it deposited a terminal moraine of rock and soil debris—everything from giant boulders to fine particles of dust—along a stretch of land that bifurcated the region and cut across central New Jersey, Staten Island, and Long Island. There was enough deposited debris to disrupt

land drainage patterns and create new lakes and waterways; it created several glacial lakes that filled with glacial melt and fresh water, completely submerging large swathes of land. At the narrows between Staten Island and Brooklyn, the moraine dammed the Hudson River, creating thousands of acres of wetlands and marshes.

About 13,000 years ago, the modern form of metropolitan New York began to take shape as the region's glacial lakes began to drain. The glacier's weight strained the Earth's crust and its height shifted, forcing water into what would become a tidal strait, the Kill Van Kull, and New York harbor. Geologists theorize that the dissipation of Glacial Lake Wallkill farther up the Hudson Valley created enough water and pressure to push a hole through the moraine at the Verrazano Narrows. The resulting flood of water from these and other glacial lakes then rushed across the continental shelf, scouring a deep channel into the bedrock that flowed into the Atlantic's Hudson Canyon, now about 80 miles offshore.[14] Once the rush of glacial melt had ceased, salt water mingled with fresh water through the Verrazano Narrows, connecting the harbor to ocean tides. Rising sea levels from glacial melt, flowing tidewater, and a deep channel entrance, combined with the protective landmasses of Staten Island and Long Island, helped make New York Harbor an advantageous location for oceangoing trade during European colonization and throughout the history of the United States. Chosen because of advantageous port locations, colonial city sites encouraged regional development and global connections, and New York City was no exception.

The wildlife that made its home in these waters sustained the region's Munsee Indians as well as seventeenth-, eighteenth-, and nineteenth-century European and

American communities that created settlements on the edges of New Amsterdam and, then, New York City.[15] The brackish water of the Arthur Kill, the Kill Van Kull, and the shallower expanses of New York Harbor made the perfect home for colonies of oysters. Thus, oyster beds were an important fishery in the region until the end of the nineteenth century when oil pollution, dredging, and overfishing crippled their populations.[16] Microorganisms, plankton, and other small invertebrates fed larger fish, like menhaden, and sustained the water's ecosystem. The tidal marshes were home to a variety of plants: rushes, irises, amaranths, roses, grasses, and cattails, as well as algae and seaweeds.[17] A number of animals made their homes in these spaces, too. Turtles, fiddler crabs, deer, rabbits, gulls, migratory birds, and raptors all found sustenance in intertidal marshes like those in this corner of New Jersey. This water-rich landscape, shaped by its abundant plant and animal life and the interaction between fresh and salt waters, sustained the development of the region's industry in the nineteenth century, as New York became one of the most important commercial ports in North America.

When Standard Oil first moved to New York in the 1870s, it joined a landscape already modified by the hands of merchants, laborers, farmers, and industrialists. As historian Theodore Steinberg asserts, the environmental transformation of metropolitan New York "is one of the most creative acts of vandalism ever perpetrated on a natural landscape."[18] New York and its environment had changed dramatically since the first Dutch ships sailed through the Verrazano Narrows and into New York Harbor. By the mid-nineteenth century, greater New York was virtually unrecognizable from a century earlier. The grid pattern had

reshaped the island of Manhattan. Workers had removed treacherous rock obstacles in the East River. Builders hoped to create more dry land out of the marshes along the coasts of Manhattan, Brooklyn, Long Island, and Staten Island, after having already drained and filled parts of the wetlands to create real estate. Pollution and overfishing worsened with this transformation of marsh into solid ground and industrial growth, leaving populations of many fish and bird species seriously at risk. The region's industrial and urban transformation was well under way by the 1870s, and borderland communities with strong ties to the city emerged in New Jersey and Brooklyn.

Land on the edge of waterways near the growing commercial center of New York City became more valuable as the city center grew. Bayonne's Constable Hook, a southeastern promontory where the oil industry set up shop in the 1870s, was a borderland between the inner solid ground of the peninsula and the waters of New York Harbor and the Kill Van Kull. Marshes infiltrated its center. Into the nineteenth century, farmers struggled to create firm upland from the soggy subsoil. By 1844, industrious farmers had succeeded in making arable land out of Constable Hook, but the eastern portion and a large band of land connecting it with the rest of the thin peninsula were still dominated by marshes.[19] The site of the Bayonne refinery was part of a 300-acre land grant made in 1646 from the Dutch colonial government to Jacob Jacobson Roy, a gunner at Fort Amsterdam. The plot of land was then given to the English when they took control of the city in the 1660s. Constable Hook got its English name from Roy, as *Konstapel's Hoock* means "gunner's point" in Dutch. The English transliterated it to Constable's Hook.[20] Before 1812, a watermelon farm and a cemetery were the only notable establishments on the Hook. Then, during the War of

1812, the Hazard Power Company established a munitions plant and sold products to the British army. In 1875, the small Prentice Refinery opened with only twelve stills for producing kerosene from crude oil. Two years later, John D. Rockefeller purchased the refinery, symbolically inaugurating Bayonne's industrial era.[21]

Figure 1 – This 1871 map depicts Newtown Creek in the upper right section. Most of the oil refineries were clustered on Hunter's Point on the northern edges of the creek, as it empties into the East River, and in Brooklyn on the Creek's southern shore. The New York Board of Health's studies on Newtown Creek nuisances revealed that wind carried the stenches of the creeks' industry across the river to midtown Manhattan. "New York, From a Balloon. Pictorial Map of New York and Vicinity, Showing the Suburban Town, and Railroad and Water Communications," *Harper's Weekly* (supplement), May 6, 1871, https://commons.wikimedia.org/wiki/File:1871_Harpers_Weekly_View_or_Map_of_New_York_City_from_a_Balloon_-_Geographicus_-_NewYork-harpers-1871.jpg.

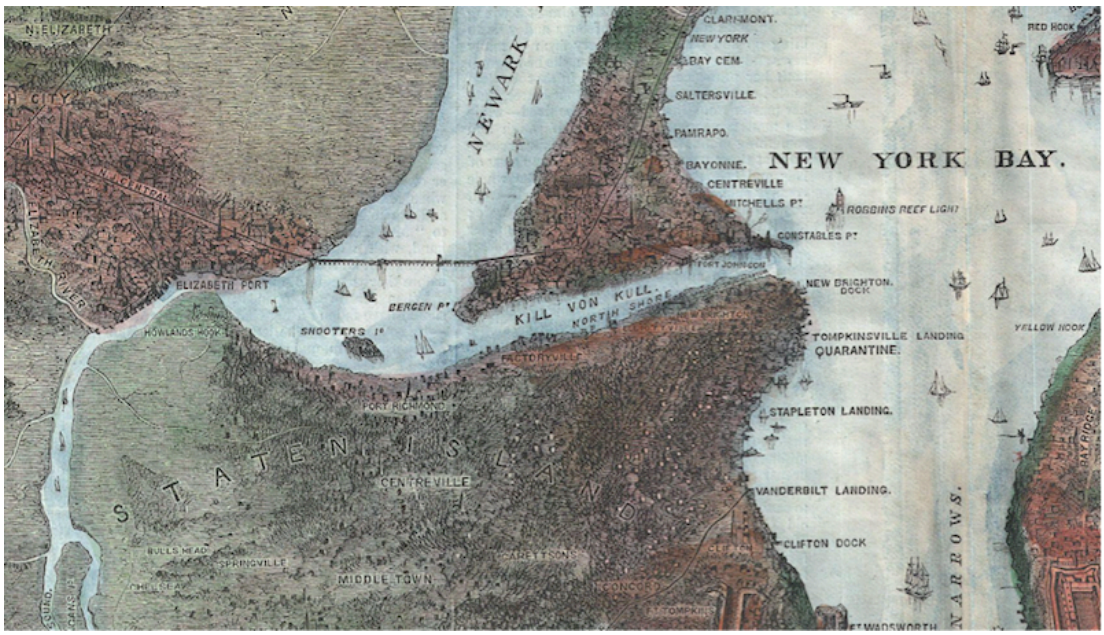

Figure 2 – At the center of this image is Constable Hook, just above the Kill Van Kull in Bayonne, New Jersey. Though it was on the edge of the city, it was quickly becoming an industrial center in its own right. The image shows the westward movement of urban industry from Manhattan. "New York, From a Balloon. Pictorial Map of New York and Vicinity, Showing the Suburban Town, and Railroad and Water Communications," *Harper's Weekly* (supplement), May 6, 1871, https://commons.wikimedia.org/wiki/File:1871_Harpers_Weekly_View_or_Map_of_New_York_City_from_a_Balloon_-_Geographicus_-_NewYork-harpers-1871.jpg.

In the second half of the nineteenth century, industries devoted to the production and consumption of fossil fuels brought oil refining into New York Harbor. Oil companies constructed facilities near waterways—sites with access to fresh water and active shipping waterways, including European shipping routes, and the ability to dispense wastewater.[22] Figures 1 and 2 are close-ups of a map printed in an 1871 issue of *Harper's Weekly*. Figure 1 depicts the increase of industry at Newtown Creek, while Figure 2 does the same for Constable Hook. Each demonstrates that although Newtown Creek and Bayonne were on the edges of the city, by 1871 they were quickly becoming growing industrial centers due to their strategic locations in New York harbor and access to Atlantic shipping routes. From the inception of the oil industry, oil products (most significantly kerosene) were

global commodities, the first barrels reaching Europe in 1861. By the 1870s, Standard Oil played a hand in producing ninety percent of the refined oil exported from the United States.[23]

John D. Rockefeller, the enigmatic and controversial founder of Standard Oil, moved the company's headquarters from Cleveland to New York City as Standard Oil's role as a global exporter of American oil refining products increased. Rockefeller began expanding into the New York City area first by purchasing small refineries and building new ones along Newtown Creek, New York and in Bayonne, New Jersey, including [24] the Prentice Refinery in Bayonne—a state-of-the-art facility that took two years to build. By 1882, only one independent refiner remained.[25]

Rockefeller's expansion in the region signified the potential he saw for growth, and his instincts paid off. Rockefeller increased the scale of Standard Oil's refining operations in the New York region so much that by the early 1880s, two thousand laborers transformed three million gallons of crude into refined products every week at Newtown Creek.[26] Standard Oil moved to New York City in 1882, setting up shop in 1885 at what would become its longtime home: 26 Broadway.[27] The move solidified Standard Oil's interest in the New York region and it became the company's financial, organizational, and operational center for over a century.

As part of Standard Oil, the Bayonne Refinery (formerly Prentice) was no backwater facility, but rather a key hub in a network of oil production and consumption that reached across the globe. In the 1870s and 1880s, kerosene made up more than half of all American-made refinery products produced for the world market.[28] In 1877, Standard Oil shipped product refined in Bayonne to its facilities in

Newtown Creek or nearby Weehawken for barreling. Petroleum products, once barreled properly, were then shipped across the world. In one shipment that summer, the refinery sent 4,500 barrels of refined oil to Norway.[29]

The processes used to refine crude oil at Bayonne were impressive by nineteenth-century standards. At Bayonne, refinery employees used distillation techniques to break down crude oil into valuable products like kerosene. The process relied on evaporating the crude over a heat source and then condensing it into separate weights. Workers distilled crude oil in horizontal stills made of cast iron mounted over fires and held in place by brick supports. A pipe created an escape for gaseous vapors into a condensing coil, where it would then condense into different fractions. The condensing coil was immersed in water, dropping the temperature and liquidizing the gaseous molecules. In order to get to the valuable kerosene, refiners first had to boil through naphtha, the family of molecules that includes gasoline.[30]

Once heated and separated at the stills, the oil was moved to agitators, where it was shaken with sulfuric acid to remove impurities. Then, workers transported the refined products to the bleaching houses—circular glass greenhouses with a forty-two-foot diameter—where the oil was exposed to the sun for a few days as a finishing process. In a barreling warehouse, coopers built wooden barrels with metal rings to transport the oil. They used thick layers of glue (often as much as two pounds) to line oil barrels. Without the glue, the refined product would seep through the wooden barrel and evaporate or leak. Along the shoreline, workers built a 700-foot dock complete with pipes to connect with oil transport vessels and pump the finished product into specially designed ship holds while other products would be loaded by

barrel. “To say that these buildings form one of the largest and most complete oil refining establishments in the country is no exaggeration,” noted an article from the *Bayonne Herald*.[31] By the early 1880s, the Bayonne Refinery was the largest in world, refining up to 374,000 gallons of crude a day.[32]

With Bayonne as the world’s largest refinery, the region became home to much higher amounts of oil pollution. From the beginning of Standard Oil’s ownership of the Bayonne refinery, the facility created environmental and public health issues. Oil seeped into the lives of those living nearby. A Bayonne Herald article from 1878 simply exclaimed, “Phew! How the oil does smell!”[33] As pipelines were built to bring oil from Pennsylvania to Bayonne, there were often accidents and leaks, spilling oil where it shouldn’t have been. In June of 1878, overpressure in a Standard Oil pipe nearly killed a man when it exploded, sending a “large fragment of iron” flying through a door and destroying a worker’s empty desk.[34] Perhaps most concerning to those living and working Bayonne was the propensity for accidents and disasters at the site. January and February of 1878 were particularly dangerous times for workers at the Bayonne refinery. At the end of January, a boiler exploded at the refinery, killing one worker instantly and leaving another to die of his injuries. The scene of the accident was gruesome. Alfred Hill, a worker who was using an engine to pump water out of a hole on the property to construct a well, had his arms blown off by the blast. His coworker Ferris Woodruff died in at the St. Francis Hospital in Jersey City, New Jersey. The details of the horrific accident likely lingered in the minds of those involved and of those who read about it in the *Bayonne Herald*, which described the “calamity at Constable Hook” as “one of the terrible disasters which are

of too frequent occurrence."[35] On February 23, 1878, the *Bayonne Herald* reported another incident. This time, though, the article was much shorter, suggesting local people's frustration with the frequency of fires. The brief report read, "The Standard Oil Company should not be unmindful of the manner in which their men carried their lives in their hands while endeavoring to save the company's property at the Tuesday night fire."[36]

Fires represented a significant portion of the public fear towards refineries and thus remained a problem influencing calls for reform from people living in Bayonne at the end of the nineteenth century. The frequency of fires at the refinery required that Bayonne's fire department be given special instructions on when to proceed with their protocol and when not to. Simply seeing smoke in the sky was not a precise indicator of a disaster, since there were often small fires at the refinery. "The nature of the operations at the oil works," an 1879 *Bayonne Herald* article explained, "is such that large volumes of smoke are caused, giving parties at a distance the impression that there is a fire."[37] The fires continued. In January of 1880, oil escaped from a still and seeped into a nearby furnace where it caught fire. Though it was quickly extinguished and cause little damage, this 1880 fire is an example of the routine dangers that existed in nineteenth-century oil refining.[38] A few months later, in July, another fire destroyed 500 barrels of oil—approximately $2,500 worth of crude.[39] Then, in October, the sounds of an early morning explosion shook nearby residents awake and a "volume of flame shot up from the vicinity of the Standard Oil Works."[40] In this instance, authorities reassured city residents that "the damage was trifling."[41] Then an even bigger fire destroyed an oil tank containing 9,000 barrels of

distilled oil worth $4,000 in February of 1881. As the *Bayonne Herald* described, "It was reported that the noise of the explosion was heard at a great distance, windows being shaken in houses at Elizabeth by the concussion."[42] Such disasters became the norm for Bayonne, and with more refineries being built in Bayonne and Newtown Creek, oil refineries were only just beginning to leave their impact on the region.[43]

In the 1880s and 1890s, Standard Oil continued to draw the ire of those offended by oil refinery pollution. Public revulsion of oil industry effluents became an important topic of debate in the New York City area. People who opposed pollution did so for various reasons. Some detested smelling and breathing the smoke and fumes. Others felt the pollution was harmful to public health. Still others had concerns about the ways the environment had changed as the result of oil pollution. The New York Board of Health's Effluvium Committee, local residents, writers at *Harper's Weekly*, and the New Jersey Board of Health opposed Standard Oil and the growing concentration oil refineries in the region for all of these reasons. Reflecting upon complaints of emissions emanating from fertilizer plants along Newtown Creek, newspapermen remarked that Standard Oil refineries "are considered by some even a greater nuisance than the fertilizer manufactures."[44] Oil refining, fertilizer, and bone boiling businesses there "shook up a compound of noisome smells the equal of which was not to be found." The smells wafted across the East River to Manhattan and sickened workers and residents alike.[45]

The debate over economic interests and public health played out in disagreements among private citizens, public officials, and oil companies. In the nineteenth century, labeling something a "nuisance" was a serious complaint with

legal consequences. Such legal action relied on the understanding that authorities were charged with protecting urban residents and their welfare. However, as Melanie Kiechle explains, while "nuisances" gave the government power to protect the public, officials more often used it in the face of threats from contagious diseases and generally ignored it when it opposed economic development.[46] In the case of Newtown Creek's nuisances, disagreements between different levels of government, the public, and news outlets prevented legal efforts to force refineries to prevent polluting New York City's air and water.

The New York and New Jersey State Boards of Health could have helped define the necessary steps to prevent oil pollution nuisances, and though they visited refinery sites and offered suggestions, they lacked enough power to officially force oil refineries to comply. Both boards were active in investigating the problem starting in 1881, but they ultimately were unable to prevent continued abuses. In 1880, the New York State legislature created the New York State Board of Health, allowing the Governor to require the Board to investigate nuisance complaints. That winter, a petition with over one hundred signatures arrived at Governor Alonzo B. Cornell's desk, requesting that he investigate nuisances at Newtown Creek. In their petition, residents of New York City sought to call "attention to certain things which in their judgment constitute a nuisance affecting the security and life and health in this city, namely, the noisome and offensive smells, generated either at Hunter's Point and other places along Long Island."[47] Residents hoped to bring this serious issue to the attention of the state's highest authority, especially since bills that would have forced the companies to abate the nuisances had failed to pass in the State House of

Representatives in 1876, 1877, and 1878, and another version of that bill was again introduced in 1881. In response to the petition, Governor Cornell asked the Board of Health to organize a panel to investigate the Newtown Creek nuisances in the spring of 1881.

The investigation of 1881 was an opportunity for the New York Board of Health to reveal the consequences of oil refining to New York officials. Sludge acid was central to the Board of Health's investigation into nuisances at Newtown Creek. In his investigations of the pollution, Board of Health president Charles Frederick Chandler employed the labor of his chemistry students from the School of Mines at Columbia College in testing sludge acid. By simply applying water to a sample of sludge acid, the students created a stench so powerful that it overwhelmed those in the building and made several students vomit.[48] On the banks of Newtown Creek, the results of that simple experiment were repeated with the movement of the tide. Low tide revealed how sludge acid wastes from the refineries—which had been dumped into the creek's waters—had accumulated on the edge of the creek's embankment. Each wave that crashed along those sludge-ridden shores created new stenches for New Yorkers to endure.[49] The Board's report concluded that "no treatment or utilization of the sludge of the oil should be permitted in the neighborhood of Newtown Creek, and that its discharge of any portion of it into the stream should be strictly prohibited."[50]

The Board of Health's 1881 report condemned the nuisances and their effects, and demonstrated the ways in which such sludge acid stenches were preventable. In doing so, the report made it clear that oil-refining pollution was a solvable problem. It

also commended the managers of Standard Oil and two other companies for working to decrease the effects of the nuisances, writing that the refineries, "with the advice and cooperation of prominent experts, have introduced many improvements tending to that result."[51] However, it also asserted that the state needed to do more make sure all of the companies complied with Board of Health recommendations for removing the sources of the nuisances quickly and effectively. In response to the report, Governor Cornell issued a proclamation on April 22 requiring such compliance before June 1, 1881.[52]

First, regulators' attentions focused on Newtown Creek, New York. In March of 1881, the New York State Board of Health commissioned an Effluvium Committee to investigate complaints about smells emanating from Newtown Creek, the tidal waterway that formed the border between Brooklyn and Queens. In the late-nineteenth century, Newtown Creek was home to most of the city's industry, including oil refining, bone-boiling businesses, and fertilizer plants. "I have listened to testimony in regard to these smells for years," Newtown Creek resident Jackson S. Schultz told the committee in March, "and have come to the conclusion that as long as the Standard Oil Company exists, and brings its oil by pipes to Hunter's Point, those stenches will exist."[53] Many local residents worried about oil's stench and about the health risks they associated with the fumes released at Standard Oil's refineries. In response to these complaints, the committee members recognized that oil refineries were a nuisance to local people living along Newtown Creek in Queens and Brooklyn.

Schultz's testimony in the Board' report is just one example of the opposition to oil refining in late-nineteenth-century metropolitan New York City. Other residents who spoke at the meeting raised their concerns about the potential for disaster. What if lightning were to hit the oil tanks? Many people worried that disasters and accidents at the refineries could endanger not just workers but also those living nearby.[54] Still others complained the smells were making them sick with nausea and diarrhea, some even claiming that the fumes had killed people. Landscape architect Frederick Law Olmstead added a prominent voice to the local complaints, submitting a written statement opposing the proliferation of the oil refining industry. The report generated by the Effluvium Committee asserted that the nuisances "are caused by carelessness in the management of the business of refining petroleum, discharging the refuse from the oil refineries, [and] the handling of sludge acid…"[55]

In the wake of the Board of Health's report, *Harper's Weekly* published a seven-week series of articles describing the nuisances at Newtown Creek throughout August and September of 1881. The articles were far from unbiased and presented images of corrupt oil companies profiting at the expense of public health, offering a contrast to the tone of the Board's report and attempting to turn public opinion against the refineries. Generally the articles depicted the oil refineries as dangerous to the public and as the object of vast public disapproval. One such piece declared, "The insolence of the great companies is well illustrated in the Hunter's Point nuisance near New York—a pest which should no longer be tolerated, and against which public opinion and indignation are fast arraying themselves."[56] Another article from August 6 claimed the oil refineries, ammonia factories, and animal-related production

buildings "generate impure gases and foul and dangerous effluvia of every kind, smearing the banks of Newtown Creek and parts of the East River shore with vile mud and slime, pouring the stench of the whole in poisonous vapors over densely populated parts of the city."[57] Over the next several weeks, the magazine continued to publish articles and images portraying the Newtown Creek nuisances as a public health nightmare.

When it came to pointing out a specific offending oil company, the writers and illustrators at *Harper's Weekly* were not shy. They had a particular corporation in mind when they changed that oil companies acted in "reckless and insolent disregard of the public interest."[58] They specifically named Standard Oil in their allegations. Figure 3 is the cover of the *Harper's Weekly* from August 13, 1881. The image, drawn by Thomas Nast, depicts two skeletons—the one on the left depicting Kings County and the one on the right depicting Queens County—draped in capes decorated with dollar signs and adorned with crowns. The two royally dressed skeletons stand beside the text from Governor Cornell's April 22 proclamation against the nuisances. The juxtaposition suggests the proclamation's inability to prevent the cessation of the nuisances, though it asserted that the offensive smells be abated by June 1. Instead, wealth from oil refining insulated businesses from the governor's threats. Banners at the top of the image proclaim, "What are you going to do about it?" The cartoon also contained the quotes, "Fun for Us, Death to the People," as well as, "The people have no rights which we are bound to respect."[59] Both quotes suggest that the companies were flagrantly attacking public health for their own profits. *Harper's* aimed these charges of greed and arrogance specifically at Standard Oil. At the top of the

proclamation, Nast included a skull and crossbones—a familiar symbol of poison—to represent the "Standard" and "Empire" refineries. Finally, Nast drew a dollar sign onto the forehead of the skull, implying that profit was the oil companies' sole motivation.[60]

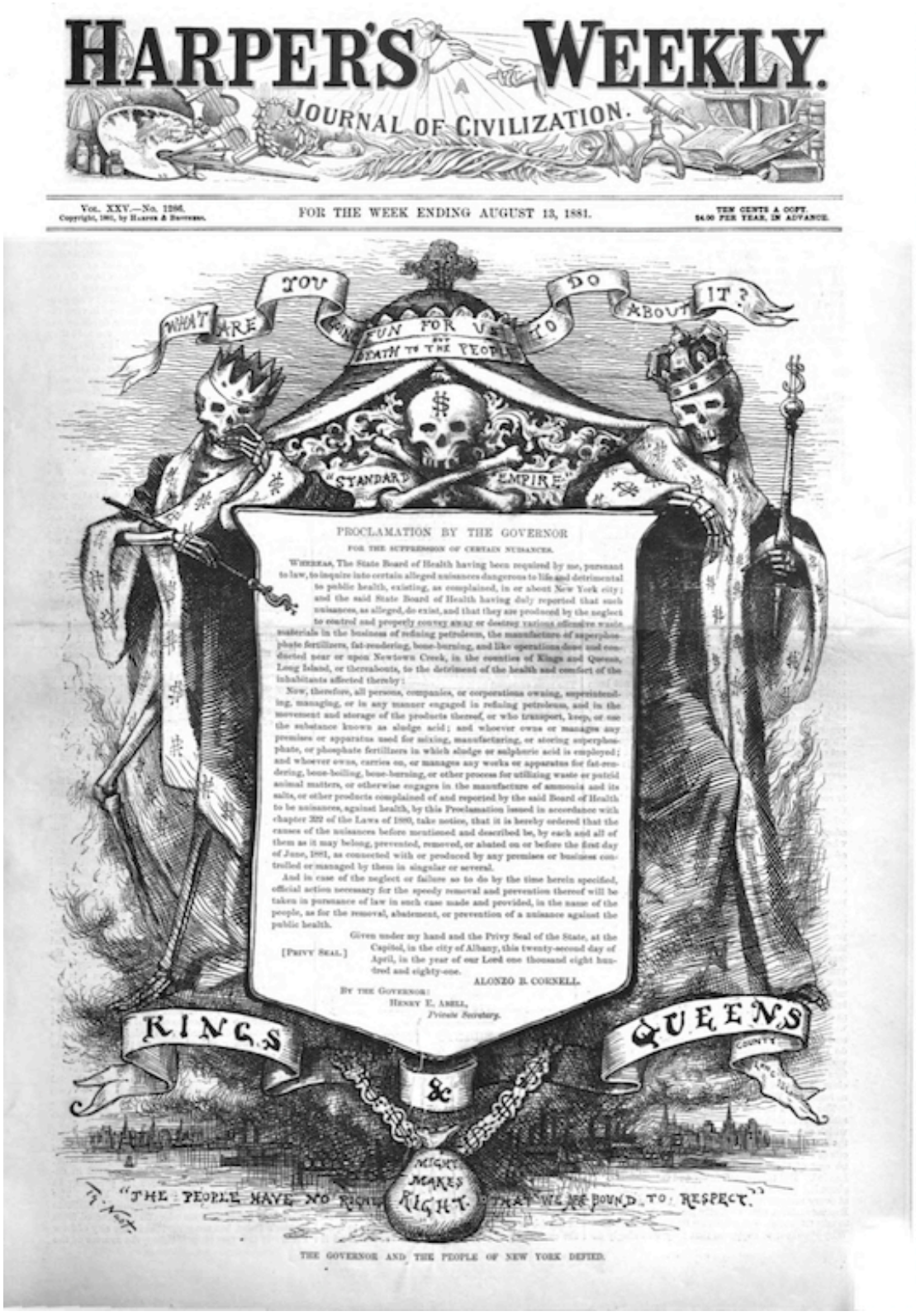

Figure 3 – This cover image from the August 13, 1881 issue of *Harper's Weekly* depicted Standard Oil as a villain behind the Newtown Creek nuisance. Thomas Nast, "The Governor and the People of New York Defied," *Harper's Weekly*, August 13, 1881, 545.

As the series of articles and this image make clear, *Harper's Weekly* tried to shape public opinion against the Newtown Creek oil refineries. On the cover of the August 20, 1881 issue, Thomas Nast depicted a winged skeletal ghost emerging from clouds of smoke and gases emanating from the smokestacks of Newtown Creek's oil refineries. Shown in Figure 4, his cover image again portrayed the idea that the oil refineries were a destructive force. In the bottom left of the image, Nast commented on how the press was a force for change, while a small inset at the bottom of the cover described "the plan." In it, the walls of a newly constructed canal channeled the waters of the East River across Hunter's Point and the shores of Newtown Creek, washing away the oil refineries in the process. Nast labeled the canal walls "the press" and the waters of the East River "public opinion."[61] In doing so, *Harper's Weekly* presented itself as the voice of the people, staunchly opposed to the nuisances created by oil refineries in Newtown Creek.

HARPER'S WEEKLY.
A JOURNAL OF CIVILIZATION.

VOL. XXV.—No. 1287.
FOR THE WEEK ENDING AUGUST 20, 1881.
TEN CENTS A COPY.
$4.00 PER YEAR, IN ADVANCE.

LET US HAVE A CLEAN SWEEP ALL AROUND NEW YORK.
THE NEXT TASK FOR HERCULES COLEMAN.

Figure 4 – The week after *Harper's Weekly* published Figure 3, it published the above image and continued to depict Newtown Creek Oil refineries as detrimental to public well-being. Thomas Nast, "Let Us Have a Clean Sweep All Around New York: The Next Task for Hercules Coleman," *Harper's Weekly*, August 20, 1881, 561.

In 1881, the New York State Board of Health, the Governor's Office, and *Harper's Weekly* recognized that these nuisances were a problem and that oil refineries in Newtown Creek were causing them. However, there was no consensus among other branches of local authorities. The Brooklyn Board of Health and the *Brooklyn Daily Eagle* emerged as a countering voice to the New York State Board of Health and *Harper's Weekly*. On March 5, the *Brooklyn Daily Eagle* reported on a meeting with the State Board about the nuisances. "A committee of the State Board of Health met… to hear argument on the nuisance said to exist in Hunter's Point and Greenpoint, and which it is claimed, are detrimental to the public health."[62] Though the article described both sides of the debate, the author seemed to side with those who disagreed with the State Board. The author described at length comments made by Dr. Raymond, a member of the local Brooklyn Board of Health, printing that at the meeting he "spoke defending the course of that department in opposing the bill giving health boards the power to prosecute nuisances in other counties." Dr. Raymond did not believe that Board of Health committees from other parts of the state had any right to impose their will within another Board's district. Another speaker, Dr. Burnett, claimed that those living in Hunter's Point on Newtown Creek "did not complain of any offensive odor from the manufacture of petroleum," According to Burnett, locals insisted the smells were not from petroleum, but from a nearby soda factory.[63]

The *Brooklyn Daily Eagle* continued to give voice to the opposition in this public debate. An article from April 25, 1881 attempted to impress upon its readers that they must not choose the abatement of nuisances over economic growth and the jobs the refineries provided. The author described the growth in population density in Newtown Creek as "a direct consequence of the industries that give rise to them," and went on to say, "It is manifestly unjust to let an investment of capital build up a community for the benefit of others, and then suddenly expel, by severe restrictions, the men who have contributed so much to the welfare of a neighborhood."[64] The situation, the author believed, was dire: "If the public has made up its mind to tolerate nothing that is unpleasant, it will find itself reduced to the village state very soon." It was impossible, from the perspective of writers at the *Brooklyn Daily Eagle*, for city residents to have "the advantages of city, country, mountain air, and seaside pleasures at once." Unfortunately, the author concluded, "They cannot have it all."[65]

A month later, the *Brooklyn Daily Eagle* expressed shock and concern at Governor Cornell's proclamation against the refinery nuisances, and on May 1, 1881, published for its readers the Brooklyn Board of Health's response to the New York State Board of Health regarding the proclamation. The letter read, "The commissioner is somewhat surprised at the outcome of the investigation of the State Board as thus developed…It would seem to him, however, that there is a serious mistake somewhere." Indeed, the Commissioner of the Brooklyn Board of Health claimed that the nuisances were not in Brooklyn, but in Manhattan, and that a report conducted by Dr. Raymond, concluded that "the nuisances complained of by New York people were located beyond their jurisdiction, and they had no power to reach them or deal

with them." The State Board, the Commissioner asserted, should look elsewhere for the perpetrators of smell nuisances.

Local officials in Brooklyn were far less concerned with the nuisances than officials from the New York State Board of Health and explicitly opposed limitations on oil refineries. The *Brooklyn Daily Eagle* continued to publish articles contesting the nuisances. In June of 1881, they reported factory owners' opinion that "their money was in their business, and as citizens of the State and taxpayers they were entitled to the common privileges of businessmen."[66] Even though the New York State Board of Health created a lengthy report detailing their findings, it was not enough to convince officials in Brooklyn that local businesses should change their practices in response to public complaints.[67] In addition, the state legislature failed to pass the 1881 bill that would legally force the oil companies to reduce their pollution. Thus, although refineries in Newtown Creek were the focus of some public ire, they were not legally bound to change their processes. Moreover, while opponents of the nuisances focused their attention on Newtown Creek, environmental degradation continued in Bayonne.

Oil refinery pollution caused trouble in Bayonne, and sometimes local authorities intervened to prevent pollution. In June of 1880, the mayor of Bayonne stepped in to stop Standard Oil from illegally dumping garbage into a cove. The chief of police had caught Standard Oil employees in the act, and Mayor Lane issued an order prohibiting Standard Oil from dumping in the future. "You are hereby notified that dumping of garbage, at this season of the year, upon our shores or adjacent thereto is strictly prohibited by law," the order read, as the mayor claimed his

responsibility to protect "the health of our city."[68] A few months later, in October, oil pollution also caused controversy when Standard Oil came into conflict with state authorities on the construction of a pipeline from Hackensack, New Jersey, through Newark Bay, and on to Bayonne. The *Bayonne Herald* reported, "If the pipes should break while oil is in transit, the effect would be ruinous to the oysters and fisheries."[69]

As in New York, there was no consensus for how to deal with oil nuisances in New Jersey because of the debate between economic growth and public health. In 1880, the New Jersey Board of Health recognized not only the nuisances caused by sludge acid, but also the difficulty of solving interstate nuisance issues. Officials from the Board of Health discussed the sludge acid nuisance in Elizabeth, New Jersey, located at the intersection of the Arthur Kill, Kill Van Kull, and the southern end of Newark Bay just a few miles west of Constable Hook. As winds brought the stenches of Newtown Creek into midtown Manhattan, winds possibly also carried the smell of Bayonne's sludge acid problem to Elizabeth, and those smells compounded with wastes from refineries in Elizabeth. The New Jersey Board's 1880 report describes the nuisances' negative health outcomes, asserting, "in very many, beside discomfort, it produced a sensation of oppressive breathing and nausea, and it was claimed that in others it caused headache, diarrhea, and other serious sickness."[70] Unfortunately for New Jersey residents, the report noted that foul odors were not enough for litigation against the offending companies, and that "our own courts have heretofore been exact in their requirements as to proofs of actual evil effects to the human system."[71]

However, the Board's report also admitted that it was clear to them how oil pollution from New York was changing the local environment. The New Jersey

Board of Health report read, "[A]lready our chief routes to New York City are tainted with questionable smells, and the refuse factories which are driven from the cities of other states, find refuge within our limits."[72] Here, the Board recognized how this part of New Jersey was becoming, what historian Joel Tarr has called, a sink for industrial wastes.[73] The report asserted that New Jersey must not allow this kind of degradation to continue. "We must insist upon it," the Board's report continued, "either that such establishments are not placed in our midst, or that they be conducted according to the methods consistent with our proper comfort and health."[74] In the 1880, the New Jersey Board of Health recognized the threat that oil refineries and other industries meant for public health.

In the following year's annual report, the New Jersey Board of Health continued to assert its fears that New Jersey was quickly becoming home to the dirty industries that New York no longer wanted. The 1881 annual report asserted, "It is believed that many objectionable factories will incline to remove with the limits of this State."[75] That year, the New Jersey Board visited the refineries on Constable Hook along with the New York State and Bayonne Boards of Health, assessing the pollution there. The New Jersey Board portrayed oil pollution as a serious concern, noting in its annual 1881 report that "the odors are prejudicial to health and comfort," and went on to say, "It is also now known that, by proper apparatus and oversight, most of the evil can be remedied."[76] Although inspired by the efforts of Standard Oil and a few other companies who had begun to use separators to remove some of the sludge from wastewater, the report lamented, "We find too, that some of our cities incline to push their nuisances into country districts which need to be on the guard

against such encroachments and see to it that all such material is rightly handled."[77] It was apparent to New Jersey's Board of Health that being home to industry also meant being home to industrial pollution.

Neighbors of the Bayonne refinery in Staten Island, New York, had similar complaints to inhabitants affected by nuisances at Newtown Creek. Residents of New Brighton, New York, just across the Kill Van Kull from Constable Hook, directly blamed the oil refineries, especially Standard Oil, for pollution. In 1881, the New York Board of Health recognized that effluents from the Bayonne refineries did "imperil the health and interfere with the comfort and convenience of residents on the neighboring shore."[78] But it wasn't just the smell. As air pollution wafted two or three miles inland, the particles floating in the air covered the interiors of residences, damaging property and disgusting homeowners on Staten Island. In addition, a thick film covered the waters of the Kill Van Kull, preventing people from swimming and bathing.[79]

As conditions in the Bayonne area grew worse, the New York Board of Health again investigated the Bayonne refineries in 1883. The organization sent three inspectors to Bayonne to determine whether any refineries operated with disregard for public health. Inspectors found that at the refineries inspected, "no less than 6,490 gallons of *'sludge'* or *'sludge acid'* as it is termed, are daily produced." Of that quantity, Standard Oil was responsible for producing 3,487 gallons a day.[80] Moreover, the examiners found that a supply pipe used by Standard Oil's Bayonne refinery to transport sludge acid had an extra branch pipe. While some of the sludge acid was transferred to their dock, stored in closed-tank boats, and then sold to a

fertilizer company, the sludge that moved through the extra branch was diverted into unfilled marshes near the shore of the Kill Van Kull.[81] They also found ditches overflowing with oily and waxy wastes from the paraffin works that spilled into the marshes and covered nearby ground, "without any attempt whatever being made to recover it or prevent its entering the creek." It was so bad, "a lake of this material, some thirty feet in diameter, has been found just within the boundary line, which slowly and continuously flows into the creek, or remains as a nasty semi-fluid mass upon the ground over which it passes."[82] Thus, even though Standard Oil sold some of its sludge acid, much of it still found its way into nearby waters.

Investigating the oil agitators, the inspectors found the most flagrant violations at Standard Oil's Bayonne refinery. Water used in the agitators needed to be separated from oily residues before being released back into the creek. A large trap box with seventeen individual compartments was supposed to clean the water. Yet, as inspectors found, "evidently this is not accomplished, as the last partition, nearest the overflow, contains more oil than many of the others, and the water in all the partitions is more or less covered with oil." Here the inspectors were disappointed in the mismanagement of the wastewater system. "As a result of this careless management," inspectors charged, "an immense amount of oil escapes with the wash waters. During our inspections we have seen the waters of the creek, at and for considerable distance about the outlets of these box traps and this underground sewer, thickly covered with oil which has thus escaped."[83] The inspectors made one final complaint against Standard Oil, including, "it is necessary to report that this refinery gives rise to an enormous amount of unnecessary smoke."[84]

Despite the New York State Board of Health's investigation at Bayonne, it had little power to stop offending behaviors. Instead, the Board simply urged the refineries to make changes in their practices, but the refiners had no legal obligation to comply. The report asked Standard Oil to improve conditions at the Bayonne refinery in eight different ways. Among these, the Board suggested, "that sufficient tankage capacity be provided to receive all tar and other semi-liquid refuse from stills and paraffin works, instead of allowing it to flow upon the ground and into the drains."[85] In addition, they thought "considerable improvement" would be made if Standard Oil filled the remainder of its marshlands with "good material" instead of "tar and oil refuse" in order to help contain the spread of oil wastes.[86] The company was under no legal obligation to do so.

Unfortunately, as environmental pollutants crossed state lines, they ceased being the concern of the polluters and local people were left at the mercy of the oil industry. Because of the report, the New York Board of Health passed a resolution calling on the Governor of New York to request that the Governor of New Jersey aid in abating the nuisance problem.[87] By 1886, a reporter noted in Staten Island's *Richmond County Advance*, "If sludge acid was an 'epidemic,' we should say that it was prevailing to an alarming extent in the Kills."[88] The nuisances continued undiminished through the turn of the century.

Although the New Jersey Board of Health recognized sludge acid nuisances, local officials from Bayonne refused to even concede that a nuisance existed. An article in the *New York Times* from December 25, 1892 asserted that "New Brighton must put up with smoke and fumes" from Bayonne's industrial quarter on Constable

Hook because Bayonne Board of Health representative Dr. Robert G. Nolan "says there is no remedy and that the big refineries of the Standard and the Tidewater Companies cannot be driven out." In addition, the article claimed that the mayor of Bayonne "has explained that the sulfur and copper fumes are a benefit to health, and the sanitary condition of the arid Hook, where trees will not live." This argument is rooted in the nineteenth-century idea that smoke equated progress. Historian David Stradling asserts, "So closely connected were smoke and economic growth in the minds of urban Americans of all classes that smoke symbolized prosperity and images of thick smoke, both literary and pictorial, frequently represented economic health at the turn of the century."[89] Here, Bayonne officials went one step further by claiming, without irony, that the refineries and their wastes were good not just for economic well-being but also for public health. The article continued, "Mayor Farr points to the healthy condition of the thousands of men employed and residing on the Hook." Local officials rebuffed claims that the refineries were the source of public nuisances, and the Standard and Tidewater refineries would not be asked to leave.[90]

Left without official protection from oil nuisances, those living near Bayonne had to put up with oil pollution. In 1893, an oil refinery owner from Titusville, Pennsylvania visited the refineries at Bayonne. Instead of being awed by "an enterprise of great dimensions" at the Bayonne refinery, he was distraught by the evidence of environmental degradation.[91] The Pennsylvania refinery owner "expressed his surprise that the smoke nuisance at Constable Hook should be tolerated by the citizens here."[92] Instead, he thought the refineries should try to capture the smoke they produced and use it as fuel for the boilers. He claimed that

Titusville was "free from impurities," and the air was as clean as in "open country."[93] Even so, the visitor believed that the "contempt of law of the corporations at the Hook" caused "indulgence of so abominable a nuisance and of so flagrant a violation of law."[94]

Large-scale disasters continued to shape people's relationships with the oil refineries, as well. On July 4, 1900, a lightening strike set off a massive fire that burned the plant for five days, nearly destroying the entire Bayonne facility. The plant's panic-stricken neighbors abandoned their homes along Twenty-Second Street, as fire consumed nearly the whole of the plant's 200 acres. Twenty-five oil tanks were destroyed, some violently exploding and sending smoke and ash into the air. No one perished in this fire, but a number of workers and firemen suffered injuries. Standard Oil estimated fire damages at over $2.5 million.[95] In the aftermath of the fire, one resident from Staten Island's North Shore wrote to the editor of the *New York Times*, concerned about the persistent dangers the refineries created: "Can nothing be done to relieve the north shore… of the smoke abomination that is so rapidly depopulating this once beautiful residential gem?"[96]

Events like the 1900 fire likely loomed in local consciousness. In letters to the editors of locals newspapers, concerned citizens asked lawmakers to consider the public's well being through the abatement of such nuisances. "Is it possible there is no means within the laws of the land to prevent such corporations as the Standard Oil Company," the perturbed Staten Island resident continued, "from maintaining such nuisances as those now existing on Constable Hook?"[97] Locals, it seemed, were the biggest voice for changing Standard Oil's practices, yet such was the suffering of

New Yorkers on Staten Island's North Shore. When faced with dangers and pollutants from the oil industry, all they could do was plead for help from the state next door.

At the beginning of the twentieth century, officials in New Jersey for the most part practiced a "not-in-my-backyard" approach to water pollution and sewage. In 1903, local authorities considered plans to build a large sewer to remove the refuse from the cities of Newark and Passaic, as well as other small towns along Newark Bay and the Passaic River. The proposed sewer would take refuse to New York harbor, as close as possible to the New York state border, and move through the town of Bayonne, thereby transporting the waste into New York's waters and making North Jersey's municipal garbage New York City's problem.[98] Though never completed, the plans epitomize how some local New Jersey authorities perceived waste. Officials did not take action against the oil refineries in Bayonne, likely because concerns were from those living out of state. They saw little need to clean up New York. New Jersey legislators did not take up the cause of oil refinery pollution until the 1920s.

Despite complaints from nearby residents, Standard Oil continued investing in the region, deepening the environmental degradation caused by oil refining. In 1908, the company bought more land on Constable Hook to expand operations at Bayonne, and the following year it officially opened a new refinery on the nearby shores of the Arthur Kill.[99] Shown in Figure 5, the Bayway Refinery was built farther from New York City, but still had access to its harbors. Standard Oil designed Bayway to be the biggest oil refinery in the world, larger even than Bayonne with its new land

acquisitions. The *New York Times* followed the construction of Bayway, calling the new facilities "gigantic" and a "monster," and claimed, "the new plant will be the largest in the world, one section of it covering almost a thousand acres."[100] The refinery initially promised 1,200 employees and as the company grew, planned to reach 5,000 new refinery jobs.[101] With the Bayway Refinery, Standard Oil was "bringing the centre of the oil industry of the world to New Jersey."[102]

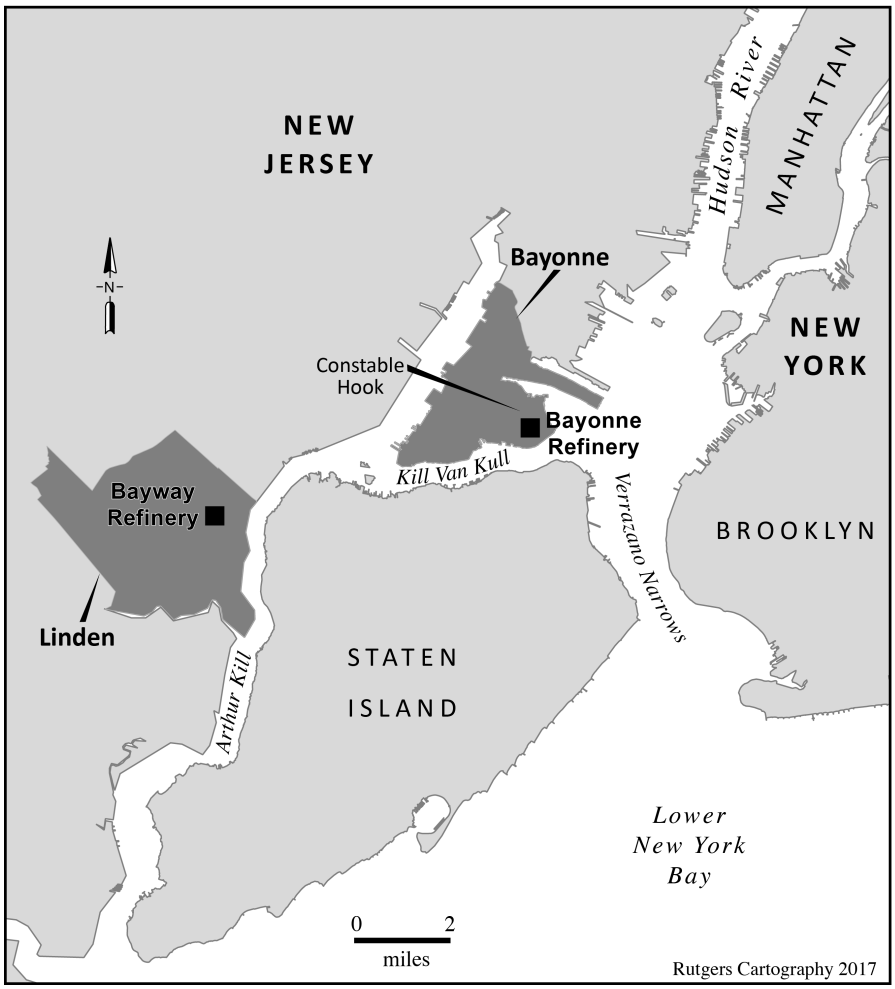

Figure 5 – This map of the region shows the borders of Linden and Bayonne and the locations of the refineries within the New York metropolitan area. Though the Bayway Refinery was further from the center of the region, it was still accessible by water from the Atlantic Ocean. *Rutgers Cartography 2017.*

As an added consequence of the expansion of oil refining in New Jersey, Bayway's construction rearranged the immediate environment on the shore of the Arthur Kill. Workers hewed the woods and filled the marshes in order to prepare for refinery construction. In building the refinery's structures, contractors supplied 12,709,500 feet of lumber, 22,795 tons of sand, 28,597 tons of crushed stone, 30 million pounds of tank steel, 1.4 million pounds of structural steel, and 13 million bricks. Standard Oil also made significant developments to the shoreline, adding docks and filling in marshes, as the state of New Jersey granted piers and bulkheads permits along its 3,450-foot coast.[103] Around the refinery, building and loan companies built homes for workers, aiding in the transformation of the nearby landscape. Thirteen groundwater wells were dug to supply the plant with 32 million gallons of water a day. A *New York Times* writer remarked in wonder at the rapid pace of construction: "[W]here was a few months ago a wide stretch of woodland and farmland is now a populous community—a little city built over night."[104] In all, it took less than a year to complete construction of the plant, and by November of 1908 it was operational.[105]

Increasing demand for gasoline drove the construction of Bayway and the expansion at Bayonne. During the first decade of the twentieth century, gasoline began to replace kerosene as Standard Oil's most valuable product. However, before gasoline was profitable it was waste. In fact, refiners considered gasoline to be waste for much of the oil industry's early history. In the nineteenth century, refinery employees used basic distillation techniques to separate the different kinds of hydrocarbon molecules found in a given batch of crude oil. Those techniques often

characterized the hydrocarbons with the lowest molecular weight, like gasoline, which is generally five to seven carbon atoms, as valueless. Gasoline's low molecular weight also made it a flammable and unstable product, and its explosive nature did not readily lead to its use as an illuminant or industrial fuel. Before the popularization of automobiles, refiners had very little use for it, often simply disposing of the gasoline fractions however it was most convenient. Many refinery workers poured the useless liquid into a pit and set it on fire; others would let it drain into a nearby water source.[106] While on the witness stand during anti-trust trials in 1908, John D. Archbold, then Vice-President of Standard Oil, admitted, "In the early days, I can remember seeing the naphtha distilled from oil run into the nearby creek or burned. The uses of naphtha and gasoline were not appreciated then."[107] It is likely that millions of barrels of gasoline were simply dumped into New York Harbor before gasoline became the oil industry's most important product.

In this context of environmental degradation caused by industrialization, New Yorkers worried about oysters. As development reshaped New York harbor, clean and unpolluted oyster beds became rare. New York Harbor had been home to a prolific oyster population before industrialization and the construction of oil refineries. In the mid- to late-nineteenth century, oysters were a popular food both in the U.S. and abroad, and the market for local oysters thrived.[108] Since oysters feed by filtering the surrounding water, they are exposed to whatever water pollutants are present. In the late-nineteenth century, New Yorkers grew concerned about pollution affecting oyster beds and some effort was made to prevent their demise. In 1885, as part of the protection effort, New York State Fish Commissioner E. G. Blackford

appointed Joseph W. Mersereau, a former oyster planter and current Pennsylvania Railroad Company worker, as State Oyster Protector. Mersereau's new position, which earned him a salary of $1,000, was supported by a bill which "provides that it shall not be lawful for any person or persons, corporation or corporations, to place or cause to be placed in any waters within the jurisdiction of the State any sludge acid or other refuse matter resulting from … any oil refinery or oil works."[109] In 1886, Mersereau brought legal charges against two gas companies in New York for depositing sludge acid in the Kill Van Kull. He asserted, "The pollution of the waters in this way will render valueless a large number of rich oyster beds in the vicinity."[110] Oil, Mersereau knew, was the biggest threat to oysters.

By 1905, however, there were few usable oyster beds left to service the region's oyster markets and the region's transition to an oil refining industrial landscape was irreversible.[111] Oyster consumers came to know New York-fed oysters for their oily taste. The New York Bay Pollution Commission's 1908 report confirmed the suspicion that pollution was responsible for declining oyster populations, asserting, "Our analyses show that most of the oysters grown in the Lower Bay are not dangerously polluted, but that those which are taken from contaminated water are practically certain to be contaminated themselves."[112] Specifically, the report describes the Kill Van Kull as heavily polluted, and oysters treated there—often oysters would be raised further from the New York markets and then left for a certain amount of time in local waters to "drink" before sale—were exposed to seven million gallons of introduced sewage and pollution per day.[113] In another example, "drinking" oysters were found left in areas covered in "a scrum of

grease and petroleum," littered with decaying sewage and refuse.[114] Oil industry pollution, combined with staggering amounts of sewage wastes regularly disposed of in the harbor's waters, created difficult conditions for cultivating oysters and contributed to an overall decline in water quality.

When Standard Oil moved into refineries at Newtown Creek it became a target for local people, newspapers, and state health officials who were dismayed by the area's industrial pollution. As Standard Oil expanded refinery operations at Newtown Creek, the company was subject to criticism from locals, officials from the New York State Board of Health, and from *Harper's Magazine*. *Harper's* writers and illustrators frequently described Standard Oil as a villain whose wastes were not just a detriment, but also a significant public health concern for New York City. Based on the results of the New York State Board of Health report, in 1881 Governor Cornell pressured the Newtown Creek refineries to cease the practice of dumping sludge acid into New York harbor. Still, most refineries ignored his calls for change. In addition, other levels of local government in Brooklyn were unsupportive of the calls to regulate oil refineries and their nuisances, while articles in the *Brooklyn Daily Eagle* challenged the state Board of Health's recommendations. The New York State Legislature failed to pass a bill legally binding them to do so and the local Brooklyn Board of Health refused to acknowledge oil refining as the main cause of the offending stenches. Intra-agency disagreement within New York State likely contributed to the failure to pass a bill to regulate oil pollution.

At the same time, Standard Oil expanded their operations into Bayonne, New Jersey, creating nuisances like sludge acid and smoke that offended

people living nearby. However, like their counterparts in New York, New Jersey officials disagreed amongst themselves about nuisances created by Bayonne's refineries, and locals in Staten Island, who saw little of the profits from the oil industry, lamented the increase in pollution, labeling sludge acid nuisance an "epidemic."[115] By voicing their concerns in local newspapers and to state agencies, concerned residents from Staten Island's North Shore hoped that state and local governments would regulate the worst offenders. In the last decade of the nineteenth century and the first of the twentieth, local citizens led the push to reform public policies and business practices in order to reduce pollution and nuisances from industry. Local authorities in Bayonne, however, welcomed Standard Oil and claimed the familiar idea that smoke and pollution were signs of progress. And even though the New Jersey State Board of Health expressed concerns about the sludge acid nuisance in its 1880 and 1881 annual reports, there was little formal pressure in New Jersey for change.

In the first decades of the twentieth century, the oil industry continued its expansion in New Jersey. The construction of Bayway, which replaced Bayonne as the world's largest refinery, spurred decades of growth for Standard Oil in New Jersey. Environmental reforms played an important part in the Progressive Era, especially in urban centers like New York City, but by the mid-1910s, the tenor of the environmental reform movement began to shift. As progressive ideals moved away from government intervention into industry on behalf of the public, concerns about the refineries lessened for the time being. By the late-1910s, however, it became clear to city officials and administrators that these environmental problems could be solved

with technical solutions from within the industry. As Progressive Era ideals changed, many looked to technical expertise rather than regulation for solutions to environmental problems.[116] By 1920, industrial pollution, specifically air pollution, gradually became "a private conservation issue."[117] As conversations over public health changed, the oil industry remained unwilling to institute large-scale changes in its operations in order to lessen pollution from oil refining.

The growth of Standard Oil in the New York metropolitan region was defined by both enormous profits and unhindered environmental degradation. Though early challenges failed to change refinery practices, by 1908 even Standard Oil's Vice President, John D. Archbold, recognized the new idea that materials once considered waste, like naphtha and gasoline, could be profitable refinery products.[118] The company's approach to pollution changed as both demand for gasoline grew and concerns about oil pollution in oceans and harbors again entered the public conversation in the early 1920s.

CHAPTER 2

Politics and Pollution at the Refineries, 1920-1960

In the late 1940s, the *Esso Refiner*, a company newspaper for Standard Oil of New Jersey's refinery employees, began a series of cartoons—"Otto Nobetter and Will Duwright"—that attempted to educate employees about waste reduction and best practices on the job. Frequently the cartoons focused on conserving crude oil and reducing the amount lost in wastewater or via evaporation during refinery processes. In Figure 6, Otto Nobetter opens a tap at the bottom of an oil tank to draw water that has sunk to the bottom. The tapped water flowed through the drains into a separator where some oil would be removed from the wastewater before it was released back into the environment. However, separator technology was far from perfect and often oil escaped. In the cartoon, Will Duwright happens to notice the oily sheen on top of the water flowing into the drain and alerts Otto. Otto's carefree response, "So what? We lost maybe a quart or two," suggests that it's ok if a little bit of oil was lost. Will disagrees. He chastises Otto: "You'd better wake up to the fact that company-wide we lose 650 barrels a day at the separators—and a large part of the separator loss is due to careless water drawing."[1]

The scene in Figure 6 demonstrates how conservation practices had infiltrated oil refineries by midcentury. Here, Otto and Will represent two different types of manufacturing practices. Otto Nobetter, on the one hand, represents old-fashioned and unscientific methods of factory processes. Will, on the other, represents how science, technology, and efficiency had reshaped industrial practices. Mechanical precision and employee efficiency not only reduced wastes, but also saved the

company valuable oil. That Will uses an averaged figure—650 barrels a day—suggests company-wide oversight of waste practices. This attention to detail is a dramatic departure from late-nineteenth-century oil refinery practices, and demonstrates how scientific management and industrial conservation practices reshaped refinery processes and employee responsibilities by midcentury. This chapter asks broadly how and why conservation practices were adopted at Standard Oil of New Jersey's (SONJ) Bayway and Bayonne refineries.

Figure 6 – This cartoon and others in the series illustrated the *Esso Refiner*, a newspaper for refinery employees at SONJ during the 1940s. The cartoons attempted to educate employees about refinery conservation practices. "Otto Nobetter and Will Duwright," *Esso Refiner* 21, no. 24 (December 2, 1949): 6.

The transition to adopting industrial conservation methods in oil refineries, which I call crude conservation, evolved out of political events in the 1920s. After World War I, oil pollution increased dramatically in New York and New Jersey as oil production escalated to meet the demands of a wartime economy. Afterwards, New

Jerseyans were left with waters far more polluted than they had been decades earlier. Increased oil pollution fomented criticism of oil refineries, and the National Coastal Anti-Pollution League, formed initially by New Yorkers and New Jerseyans, helped to create a public campaign for federal regulations of oil pollution in ocean waters. In the lead up to the debates for the Oil Pollution Act of 1924, New Jerseyans worked to create a groundswell of support for federal regulations. In the debates over the legislation, New Jersey Congressman T. Frank Appleby and Senator Joseph S. Frelinghuysen emerged alongside David M. Nueberger of the National Coast Anti-Pollution League as major proponents of the efforts to regulate land-based sources of refinery pollution, as well as that from oceangoing vessels. Though the bill ultimately did not regulate land-based refineries, it shaped how SONJ and the oil industry in general would approach oil pollution for decades.[2]

The oil industry actively adopted the tenets of Progressive conservationism in the wake of the Oil Pollution Act of 1924. Though critics have chastised the act for its weaknesses—a main critique being its omission of restrictions on land-based sources of pollution—it encouraged the oil industry to address petroleum pollution on its own without state or federal oversight.[3] By the 1920s, the ideas of conservation and scientific management had become a creed among Progressive reformers. As historian Samuel Hays explains, conservation originally emerged between the 1890s and the 1920s as a way to manage and develop natural resources using rational planning. Such practices convinced some industry leaders and policy makers of the benefits of applying scientific management principles to natural resource use across a variety of industries. As Hays has shown, conservationists argued that industry-

specific engineers, technicians, and specialized workers should solve environmental problems, not politicians or government officials. This perspective shifted the site of natural resource expertise from the government to private industry.[4]

The oil industry's acceptance of conservation relied on conservationism's friendliness towards corporations.[5] Instead of equating resource use with exploitation, conservationists worked with and within industry to maximize profit and control resource use. As Hays argues, "Both groups placed a premium on large-scale capital organization, technology, and industry-wide cooperation, and planning to abolish the uncertainties and waste of competitive resource use."[6] Refinery conservation, in practice, furthered the idea that environmental protections and safeguards should come from within the industry, not outside of it. Faced with the problem of environmental pollution, oil industry representatives coopted the language of efficiency and scientific management to respond to critics. By the 1920s, this language also shaped the industry's interactions with government agencies.

What emerges is a story about balancing profit, convenience, and risk in the face of a public concerned about oil pollution. This chapter argues that Standard Oil reshaped its refinery practices in the wake of the 1924 bill and the American Petroleum Institute's (API) recommendations, and in doing so remade their approach to environmental issues more broadly. From the late 1920s through midcentury, the company encouraged its refinery employees to reduce waste and increase efficiency. Evidence of Standard Oil's effort to reduce waste at its refineries abounds in employee newspapers and its internal reports. The company used different formats, including posters campaigns and employee competitions, as well as cartoons and

articles in refinery newspapers, to encourage employees to address waste in every part of the refinery.

In practicing crude conservation at its New Jersey refineries, Standard Oil participated in the reshaping of industrial practices in order to both increase profit and lessen environmental degradation. Standard Oil's use of technological practices to combat environmental problems begins here, and the company's efforts in crude conservation contributed to the decline in visibility of the environmental impacts of oil refineries. Throughout the twentieth century, the corporation continued to use this rhetoric of environmental control within the industry, building on their expertise in crude conservation and in the development of the petrochemical industry.[7]

I tell this story by following the oil. First, I explore how growth at the refineries created more pollution in New York Harbor. Then the chapter tracks the oil's movement as it spreads south along the coast of New Jersey, leaving tarry beaches in its wake. The chapter then recounts how local New Jerseyans helped create a national movement supporting legislation against refineries. By analyzing the Bureau of Mines report from 1923 as well as testimonies from congressional debates preceding the Oil Pollution Act of 1924, I unravel the arguments made by both supporters of comprehensive legislation and the industry itself in an attempt to limit the strength of potential regulations. Following those debates, the chapter shifts focus to Standard Oil's response to the Oil Pollution Act of 1924. I analyze the company's integration of technologies aimed at reducing refinery wastes, the creation of an internal committee to monitor refinery losses, employee education programs about crude conservation, and local efforts to publicize refinery crude conservation

practices in response to refinery accidents at its Bayway and Bayonne refineries from 1930 through 1960.

Refineries grew in size and economic significance in the 1910s and 1920s, and this growth transformed the region. By 1915, Bayonne and Bayway were among the largest refineries in the United States, with a refining capacity of 45,000 and 30,000 barrels of crude a day, respectively.[8] By 1922, northeastern New Jersey had become the world's largest petroleum refining region. Refining was also New Jersey's fastest growing industry, worth $80 million in 1904 but $281 million in 1919.[9] All of these changes meant that the region produced much more oil than ever before.

Economic growth caused conditions in the harbor to degrade. In 1909, pollution in the harbor was determined by measuring the dissolved oxygen available in the water. Water needs a certain amount of oxygen to support life, and high amounts of pollution disperse oxygen molecules throughout the body of water, thereby reducing oxygen levels and stressing marine life across the food chain. Nineteenth-century scientists thought that oxygen levels could be renewed by wind, but scientists in the early twentieth century came to see these figures as overestimations, becoming seriously worried about the amount of oxygen in water. Although New York City's scientists had lengthy debates amongst themselves about the appropriate levels of oxygen in water, percentages lower than 50 percent were generally understood to be unsustainable for fish life.[10] Between 1919 and 1925, the Kill Van Kull consistently registered dissolved oxygen levels below this percentage because of oil pollution from Bayonne's refineries.[11]

Even so, dissolved oxygen levels failed to provide a complete picture of how oil refinery byproducts were changing the local waters. Scientists were unable to give sufficient quantifications for allowable levels of oil in water, giving those who hoped to limit disposal of oily discharges into the bay little hold over the industry.[12] Reports of oil in the harbor from the 1910s and 1920s abounded. A report from New York City officials in 1919 described, "Large fields of oil which might be termed oil fields or patches are now common as several miles in diameter and often of thick consistency."[13] The problem of oil pollution was particularly concentrated near the Kill Van Kull and the Arthur Kill—the waterways on which the Bayonne and Bayway refineries were located. A Bureau of Mines Report from 1923 confirmed conspicuous oil slicks near both refineries.[14]

Unfortunately, oil pollution refused to stay put. Oil slicks were the result of the oil industry's growth in the New York metropolitan area, and they began to affect places farther from the refineries. The 1919 report continued, "But they are no longer confined to the inner harbor but drift out to sea and into Long Island Sound and in ever increasing size and quantity, causing great annoyance…"[15] New York harbor and the surrounding parts of the Atlantic Ocean were severely degraded from oil pollution in the 1910s and 1920s.

Consequently, oil pollution began to affect the Atlantic coast's beaches. On its way out of the harbor, oil slicks first became a problem at Staten Island's beaches. South Beach, located on the island's east shore, had persistent problems with oil pollution. In March of 1920, the *Staten Island Advance* reported that residents hoped the oil pollution, which was "causing so much trouble during other seasons," would

soon be eliminated. The article continued, "The fight against this drawback has been carried on through the winter by those connected with the beaches and they declare themselves sure of success." Resort and property owners on Staten Island's east shore hoped that a resolution adopted by the State Assembly would take care of the oil pollution problem that had been hampering enjoyment of the beaches during previous summer seasons.[16]

Oil eventually made its way further down New Jersey's shoreline, causing considerable consternation amongst coastal New Jerseyans. Residents, fisherman, and property owners decried the effects of oil pollution and bemoaned how oil marred their beaches. In 1920, newspapers from towns in central New Jersey and along the coast began reporting on the nuisances caused by oil pollution. At first, New Jersey's shore residents were unsure about the oil's source, but soon "suspected it comes from oil burning steamships, oil barges, or the oil pipelines ending in the Amboys, Bayonne and Jersey City."[17] The article also surmised that the oil "may have come from refineries located in the Bayonne section."[18]

Residents began to organize in response to their collective disgust over oil pollution. In August of 1920, the *Central New Jersey Home News* reported, "Seaside towns between Sandy Hook and Atlantic City will take action this week to eliminate the oil nuisance which has troubled bathers and destroyed vast quantities of fish."[19] Similarly, on June 28, 1921, the *Asbury Park Press* reported that the oil nuisance "menaced" North Jersey shore residents and they "cannot afford to spare any efforts to have the nuisance abated."[20] The beaches were residents' greatest asset, and should not be destroyed by oil pollution.

Because it refused to stay localized to oil refineries and tanker routes, oil pollution reemerged as an important topic of local, and then national, debate. New York lawyer David M. Neuberger and other shore property owners organized the Committee of 100 Against Oil Pollution at a casino in Deal, New Jersey. They hoped to put pressure on state and federal authorities to solve the problems of oil pollution.[21] Over the next few years, the New Jersey organization merged with other groups from across the country to create a national movement supporting regulations against the oil industry. In 1922, the Committee of 100 united with the League of Atlantic Seaboard Municipalities Against Oil Pollution of Navigable Waters under a common cause: "To aid the enactment of and enforcement of adequate remedies and legislation to prevent the pollution of navigable and inland waters, and to secure the cooperation of those responsible for such pollution in accomplishing its elimination by all lawful means."[22] Together, these two groups created the National Coast Anti-Pollution League comprised mostly of businessmen, property-owners, and regional and state-level bureaucrats whose industries and occupations were negatively affected by oil pollution.

The National Coast Anti-Pollution League (NCAPL) hoped to gain support from residents of New Jersey shore towns. Local newspapers printed calls for residents to petition legislators on the subject of oil pollution. On August 3, 1921, the *Asbury Park Press* included such an appeal: "All persons along the North Jersey shore, whether residents or non-residents, are earnestly requested to write their representatives and senators in congress urging them to support in the fullest measure any legislation designed to eliminate garbage dumping and oil pollution in New York

Harbor or its approaches, thus protecting the purity of bathing on the Jersey shore."[23] A day later, the *Asbury Park Press* continued the call for letters, asserting, "The North Jersey shore and the Long Island resort section have been well named the 'playground of America,' and anything that defiles that playground mars the pleasure of citizens of every state."[24] Building on similar calls for cleaning up the oil patches marring Coney Island, shore community newspapers claimed that oil at their beaches disrupted regional recreation.[25] The *Press* hoped that "word from their constituents will apprise them of the need for action."[26]

Either through civilians' individual letter-writing efforts or the actions of the NCAPL, two New Jersey legislators took up the oil pollution cause. Senator Joseph S. Frelinghuysen and Congressman T. Frank Appleby both became devoted allies of the movement. After the Congressional Rivers and Harbors Committee meeting on oil pollution in 1921, the federal government geared up for an international conference on oil pollution. Appleby was heavily involved in these proceedings, and both he and Frelinghuysen drafted bills to regulate oil refineries and reduce pollution.

Though there was public support for regulations, there was a lack of technical data on oil pollution available to inform legislative debates. The shortage of information led the Bureau of Mines to partner with the API, the most prominent trade organization for the natural gas and petroleum industries, to produce a comprehensive report on oil pollution across the nation.[27] Published in 1923, the Bureau of Mines report ended up echoing industry perspectives on potential regulation, offering conclusions that aligned with ideas about the role of technology in abating environmental issues. The report stated outright, "It is believed that

pollution by petroleum oils, as a technical problem, can be practically done away with in time."[28]

The Bureau of Mines report, and the idea that the industry contained the technical knowhow necessary to combat pollution, shaped the debates of the Oil Pollution Act of 1924. The Bureau of Mines report was heavily influenced by the oil industry, and as historian Joseph Pratt argues, that influence focused attention on harbor ships as the sole cause of oil pollution in coastal waters—a detail that would become crucial in the congressional debates for the Oil Pollution Act of 1924. As Pratt suggests, this emphasis turned Congress's attention away from considering regulations on the entire oil industry and instead towards the smaller goal of limiting pollution from ships in harbors.[29] For example, Van H. Manning, a vocal representative from the industry who managed the $10,000 of industry funds donated to finance the study, arranged government officials' visits to refineries and even sent industry representatives on these inspections. Government officials had to rely on industry cooperation for almost all access to the facilities, as they had no legal right to forcefully inspect private property.[30] These limitations dramatically shaped the study and its scope. With industry's influence, the investigation and resulting report became a reflection of industry goals, and thus reflected only one part of the oil pollution problem.

Though some pollution existed from land-based refineries, the Bureau of Mines report contended, adequate technologies existed to eliminate the problem. The report recognized, "Oil pollution from refineries may originate in leakage from stills, pipelines, filling racks, draining of tanks and from spills in the yard," yet it also

confidently claimed, “all oil released at these sources represents usable material which is usually collected by the plant drainage system leading to the separators.”[31] Here, refinery separators were a prized technology that eliminated wastes. The Bureau of Mines report overestimated the abilities of separator technologies in the early 1920s, as significant amounts of oil escaped through separators during the first half of the century. Even so, this assertion of the power of technology to prevent pollution represents a main tenet of the report—that technical and technological approaches at refineries were sufficient to control refinery pollution. The report continued, “Separator discharges of many plants are practically free from oil,” and, “the amount of oil which finally gets by some of the more efficiently operated plant separators is surprisingly small.”[32] Though it highlighted “unfavorable conditions” at smaller and less technologically-proficient refineries, the report concluded that the “proper installation and use of equipment already available to the industry would result in largely eliminating such unfavorable conditions as now exist.”[33]

In their collaboration, the API and the Bureau made technical knowledge a priority for understanding the oil pollution problem, casting concerned but non-expert voices as useless. The report also privileged specific types of information, prioritizing the scientific and technical language of refinery engineers over the less scientifically literate ideas of advocates for refinery regulation. The Bureau of Mines had access to information that was not made or monitored by the oil industry, but often found such information insufficient. The Bureau found information from the National Coastal Anti-Pollution League particularly useless. One administrator complained about David Neuberger, president of the NCAPL, in a letter in November of 1922. He said,

"We called on him last week and he had absolutely no constructive suggestions whatever to offer. In fact, the conference with him was the poorest that we have had so far."[34] Neuberger's unfamiliarity with the technical processes of oil refineries and oil tankers prevented him from providing the kinds of technical solutions offered by the oil industry and its representatives. Neuberger wasn't alone in his industrial illiteracy; other state and local agencies also were unable to match the specificity and technical fluency of oil industry representatives.[35]

In privileging technical knowledge, the report confirmed the idea that oil pollution is a problem best addressed by industry representatives, not government officials, and that there were technical solutions to the problem of harbor pollution. The report distinctly defined itself as being of an "essentially technical nature."[36] In doing so, it clearly argued what had become a main tenet of the oil industry's approach to environmental problems. In fact, the first sentence of the report's conclusion assertively argues, "It is believed that pollution by petroleum oils, as a technical problem, can be practically done away with in time."[37] The report went even further, claiming next that the oil industry must be involved in any efforts to regulate and eventually limit oil pollution. The report continued by asserting, "Its control and elimination, so far as technical factors are involved, must result from the continued attention and sincere cooperation of the parties concerned."[38]

The Bureau of Mines report shaped the available information about oil pollution across the United States. By influencing its content and message, the oil industry set the tone for the national and international debates on oil pollution that followed in 1924. In those debates, advocates of regulation faced a powerful industry

whose business model depended on the free release of waste effluents into the environment and who claimed to address problems resulting from pollution. Antipollution advocates blamed oil pollution for the wholesale degradation of America's coastal waterways, and claimed, as Senator Frelinghuysen did, that legislation should "relieve the inhabitants of the States bordering on the Atlantic and Pacific oceans from the intolerable conditions caused by the pollution of the waters by oil refuse from oil-burning vessels and industrial plants located on these waters."[39] NCAPL representatives charged that oil pollution threatened fisheries, the tourism industry, and public health.[40] Senator Frelinghuysen asserted, "Our harbors are coated with oil."[41] In opposition, oil industry representatives argued against the prohibition of oily discharges in refinery wastes, saying it was impossible to remove all oil from wastewater and that technical methods were already in place to remove all but the tiniest fraction of waste oil. Ultimately, the debate revolved around the issue of whether or not to include land-based refineries in the regulations, and in that debate, the oil industry won.

While the Bureau of Mines report shaped the technical information available to legislators, both supporters and opponents of oil refining regulations made complex arguments in the congressional debates preceding the Oil Pollution Act of 1924. On one side, politicians and civilians from New Jersey presented a strong case to regulate land-based oil refineries. On the other, oil industry representatives worked to weaken the potential bill and diverted attention from land-based refineries to ocean tankers.

Of all the voices challenging the federal government to support robust regulations on oil refining, legislators from New Jersey were perhaps the most

powerful. Senator Frelinghuysen called for tough restrictions, claiming, "If you fail to prohibit all industrial plants from discharging this filth you might as well abandon all efforts to enact legislation … and save your time by adjourning."[42] He was concerned that by allowing land-based refineries to escape regulation, the oil industry would be able to continue polluting nearby waters and that the beaches, coastal waters, and inland waterways would remain damaged by the "menace of oil."[43] Frelinghuysen and others knew that New Jersey's refineries in particular were to blame. The New York Harbor supervisor had cited the Bayonne refinery for oil pollution violations repeatedly in October of 1922, January of 1923, and again in January of 1924.[44]

Following legislators from New Jersey, the director of the NCAPL, David M. Neuberger, gave a passionate testimony supporting restrictive new laws against the refineries. He expressed his hope that the legislation would "stop the onward march of this defilement—oil pollution."[45] His testimony described how on June of 1923, hundreds of bluefish floated dead in the water in a massive fish die-off attributed to oil pollution in the Kill Van Kull. As the fish kill floated from the Kill Van Kull down to Sandy Hook over the next few weeks, it demonstrated to nearby New Yorkers and New Jerseyans the consequences of oil refining.[46] Antipollution advocates wanted, in Neuberger's words, to "secure the cooperation of those responsible for that pollution in accomplishing its elimination by all lawful means."[47] In response to repeated violations in New Jersey and across the country, antipollution advocates wanted to put a stop to the oil nuisance once and for all.

Leaders of regional trade organizations, fisherman, and others supported the voices of politicians and the NCAPL. In the official hearings, David Nueberger

entered into the record seventeen letters from a variety of different groups and individuals, each making a distinct argument supporting strong regulations on oil pollution. R. H. Corson, chairman of the Association of Surf Angling Clubs, a recreational fisherman club in New Jersey with about 2,000 members, wrote in support of restrictions on oil refineries and oil tankers. Corson wrote, "We see, in following our sport along the beaches, the destruction wrought upon the smaller marine life on which the shore-seeking species of fish feed, as a result of the oil and oil wastes floating to sea from harbors in which the oil industry flourishes."[48] He argued that regulations supported the rights of sport fishermen along New Jersey's coast. By limiting the amount of oil pollution, legislation would protect fisheries and help sustain sport fisheries.

Other voices from the region echoed Corson, though made different arguments. New York City sanitary engineer Kenneth Allen wrote in approval of the bill, "This is in so satisfactory form that it should receive the support of everyone interested in preventing the nuisance and financial loss due to this source."[49] In addition to his letter, Allen also gave a statement at the hearings. He represented several other city officials, including the Board of Estimates and the chief engineer of New York City, and made legal arguments supporting the regulations. He claimed that New York City's current laws had made only two convictions against polluters possible, labeling them "inadequate" to deal with the oil pollution problem.[50]

Others wrote making ecological arguments about the need for strong regulations. New Jersey biologist, Thurlow C. Nelson, submitted a comparatively lengthy letter documenting specific instances of environmental degradation resulting

from oil pollution, and hoped any laws passed would cover land-based sources of pollution as well as tankers. Nelson wrote, "I wish, however, to enter a very vigorous protest against the passage of a measure which limits in any way jurisdiction over any source of oil pollution… the law must be all-inclusive." Like the Association for Surf Angling Clubs, he was worried about fisheries, describing, "Serious damage has been done to shelf fisheries in Great Bay and in Little Egg Harbor, New Jersey," and "in the Raritan River Valley fish have been practically exterminated by oil wastes." He also added that it was too difficult for scientists to determine when oil leaked from a tanker or a land-based source and so both must be regulated to prevent unnecessary pollution.[51]

Others' arguments included the value of fisheries as local food sources and beaches as centers for tourism. Speaking for the coastal town of Stone Harbor, New Jersey, Mayor Clarence A. Krouse argued from both of these perspectives. Krouse wrote that oil pollution "not only ruins public bathing, but kills game birds, especially ducks, and destroy various fish-food life in the channels, creeks and bayous along the coast." He was concerned with oil destroying the populations of wild animals that some New Jerseyans relied on as a food source. He continued, "Therefore, as residents of the seacoast towns, we object to the oil nuisance, not only on account of destroying bathing, but destroying valuable food."[52]

Women from New Jersey took up the antipollution cause, presenting arguments for protecting the nation's waters from oil pollution alongside the mostly male contingent of lawmakers and NCAPL representatives. Their arguments worked to defend public health against oil pollution. Activists like Mrs. E. A. Linburn argued

that because women "look after the health, the recreation of almost, we might say, everybody, except a few unattached men, and even then there are the mothers who look after them," that oil pollution is not simply an industrial problem, but one that affects the lives of women, families, and the poor.[53] Linburn relied on women's traditional social role as caregiver to support her argument for robust legislation protecting the nation's waterways from oil pollution.

Similarly, Mrs. Clayton Lee, director of the New Jersey State Federation of Women—representative of over 40,000 women—asserted, "The club women are of course, being women, not very logical, but they do feel that it would be almost stupid to give legislation which would not be drastic enough to really be a help."[54] Lee likely hoped to magnify the fallacy of arguments that excluded land-based refineries from regulation by suggesting that even women knew that such exclusions would cripple the bill's effectiveness. Her logic, in affirming male legislators' hierarchical assumptions about gender, exposed the flaws in arguments against regulation, and heightened her point that to go easy on the industry was inadequate and inexcusable. She continued, "And if you do not include land plants in the legislation there would be very little use, in our way of thinking, of giving it to us at all."[55] In pointing out the pollution from land-based refineries, Lee underscored how refusing to place restrictions on land-based sources of pollution would exclude the main source of pollution from regulation.

Voices in support of regulating the oil industry came from across the country. F. W. Darling, owner of an oyster business in Virginia, wrote in a letter included in the hearings, "Day after day the water over our oysters has been covered with the

scum of oil making it impossible for us to catch our oysters with bringing them up in the dredge through the oil, the result being that these oysters taste of the oil."[56] A docks commissioner from Alabama wrote, "Please urge Senate Committee to recommend Wadsworth bill, which prohibits pollution by floating craft and land plants of coastal and tidal waters by oil."[57] The National Board of Fire Underwriters also supported regulations on land-based as well as harbor-based sources of pollution.[58]

However, these antipollution advocates failed to provide specific guidelines for acceptable levels of effluents or pollution-control techniques. Although they were varied and at times specific, the arguments made by antipollution advocates were weaker than arguments made by the opposition because they did not have technical expertise or quantifiable data on their side. Antipollution advocates could not compete with the technical expertise demonstrated by the oil industry's defense and the 1923 Bureau of Mines report.

Representatives from the oil industry formed the opposition to antipollution advocates and they did not attempt to fully prevent all regulations, but instead redirected them towards a less restrictive outcome. The American Petroleum Institute's director of research, Van H. Manning, clarified the oil industry's goals in his statement. Manning claimed, "It is not a fact that the oil industry is opposing this legislation." Instead, he assured the legislators that "industry is ready and prepared to cooperate with the Federal and State bodies passing sound legislation." The problem here was that Manning and the oil industry differed with regards to how to define "sound" legislation. Specifically, the industry was willing to accept regulations on

ocean tankers, but not on land-based refineries. Throughout the hearings, oil industry representatives were against the ideas that land-based sources of pollution were significant and that governmental oversight was necessary.[59]

To serve that goal, oil industry representatives used technical data from refineries to support the idea that land-based plants should not be included in any regulations. Manning employed statistics from the Bayway Refinery that made the amount of oil in wastewater from land-based plants seem insignificant. Standard Oil's plant processed twenty million gallons of water a day, drawn straight from the Arthur Kill, and he asserted that only two barrels of oil were released when effluent was discharged back into the waterway. However, in his testimony, Manning represented the twenty million gallons of water as a concentration, as 0.0004 percent, instead of the total volume. Expressing this figure as a concentration lowered its apparent significance and made the waste oil seem unworthy of regulation. By using a percentage, Manning made the pollution abstract and intangible.[60]

In the 1920s, oil industry representatives recast pollution as a technical problem. Using technical language in discussing the problem helped them attain that goal. Pollution concentrations were so small, Francis McElheny asserted, that the contamination should be considered nothing more than "technical pollution."[61] The threat of further regulation enticed refiners to enact some environmental reforms voluntarily. As historian Hugh Gorman argues, "Engineers and technical managers in the petroleum industry validated the notion of self-regulation by reducing the quantity of pollution-causing discharges released for every barrel of oil produced."[62] Technical

analysis was a crucial part of the oil industry's debate strategy, and became a way to deter criticism of their position.

If oil pollution was a technical problem, it was up to the industry, not the government, to solve it. This shift in responsibility reflected the acceptance of Progressive conservationism ideals, and recast the oil industry as the foremost expert in environmental issues. In his Senate testimony, assistant manager of Standard Oil's Marine department Robert Hand presented himself as an expert voice in the marine oil industry, claiming that his "actual experience of the problems that have been developed in the handling of oil" gave him "intimate knowledge of the conditions pertaining to the operation of tanks steamers and of ships burning oil as fuel."[63] Hand used his testimony in the Senate hearing to try to convince lawmakers to address ships and tankers, which were the "real sources of evil," rather than onshore refineries.[64]

In their arguments, industry defenders used the language of efficiency and scientific management to convince lawmakers of the validity of their approach to environmental issues. Hand argued that his company had already incorporated oil separators on both its oceangoing ships and land-based plants as means to lessen pollution and reduce waste. In using these technologies to prevent waste, he claimed, "the shore-plant separators are practically 100 per cent efficient…. There was no discharge of oil into the water."[65] Opponents of regulation, like Hand, used technical arguments to oppose regulation of land-based refineries, asserting that they had already addressed the pollution problems with technologies like oil separators, which were used to remove oil from wastewater. When the oil industry applied crude

conservation to the environmental problems associated with oil refining and production, it allowed them to defend themselves against critiques that they were unconcerned with oil pollution, and thus helped them to thwart regulatory legislation.

In addition, oil industry representatives blatantly argued that in order to survive, the oil industry needed to be allowed some level of pollutants. Francis McElheny, a representative from the Sun Oil Company, asserted, "It is impossible to get out every atom of oil. A chemical analysis at one of our outlets will show oil. It may not be visible to the eye or injurious to the rivers, but as long as our refineries are there, there is a certain amount of oil going into the water. We are taking out all we can of the oil."[66] In his statement, McElheny did not shy away from the point that forcing oil companies to eliminate all sources of pollution would force them out of business. Instead, that was a reason to protect the industry and allow them to create a response to this problem without the interference of regulation. "It is necessary to have oil refineries in this country, and we do not like to have a bill passed which we can not comply with," McElheny professed, "Anything we can do we are glad to do."[67]

Because of the hearing, Congress passed the Oil Pollution Act of 1924, which sided with industry concerns and only regulated ocean tankers and ships.[68] Such a defeat was disappointing to antipollution activists. Local voices concerned about pollution lost to the technical experts of the oil industry. By 1926, there were no state laws in New Jersey pertaining to "the pollution of waters by oil and oil wastes."[69] New York State had laws about industrial wastes and sewage, and although oil pollution was classified as such, New York did not have any legislation specifically

ruling on oil and oil wastes. In New York City, Article 4 of the Code of Ordinances provides that "no person shall discharge or cause or permit to be discharged into the tidal waters of the port of New York from any ship, steamer of vessel, any oil, oil refuse or other inflammable matter."[70] By the end of the 1920s, there were few laws restricting oil pollution from land-based refineries.

Even though it did not adequately address antipollution activists' concerns, the Oil Pollution Act of 1924 eventually reshaped how the oil industry managed refinery wastes and led to the adoption of crude conservation practices within SONJ's refineries. The act encouraged refiners to address the problem of pollution at refineries on their own terms. The oil industry assumed that if it did not voluntarily cut down on the environmental effects of oil refining, the government would enact new rules and regulations to force them to lessen their pollution.[71] In his statement at the hearing for the 1924 act, Standard Oil's Robert Hand described the logic of this idea. "I think if you have a law that applies to the whole United States prohibiting the discharge of oil into navigable waters," he explained, "you would be able to demonstrate in a very short time to the shore plant … that if they are polluting waters now they had better provide facilities, otherwise they will have laws that will affect them…"[72] Hand saw legislation regulating oil pollution for oceangoing vessels as a step towards regulating land-based refineries as well, and urged lawmakers to proceed one step at a time to ensure that these regulations did not oppress the industry. Hand's opinion echoed industry sentiments on industry regulation more broadly. With regards to the problems of over-production at crude oil extraction sites, the *Oil and Gas Journal* reported, "This left self-regulation by the industry as the only alternative

to the risk of governmental control."[73] In 1929, the oil industry hoped that by voluntarily reducing production, state and federal officials would not pass legislation regulating production levels at crude wells. Here, the industry prioritized avoiding regulation, as in the 1924 debates.

In response to the 1924 legislation, the API published a report on environmental pollution at oil refineries across the country. The API's pollution control survey from 1927 advocated methods to reduce the amount of oil or oil vapors escaping during production or transportation. And in the early 1930s, the American Petroleum Institute published several reports suggesting that the oil industry should increase efficiency and decrease wastes in all facets of refinery operations before government oversight made industry innovation in these matters more difficult. Titled *Waste Water Containing Oil, Waste Gases and Vapors*, and *Chemical Wastes*, these reports made it clear that the API wanted the industry to reduce pollution through changes in technological processes and technical methods. The suggested methods included employing top-of-the-line oil/water separators, constructing more complex sewer designs that separated wastewater and storm water, and making significant efforts to collect spent chemicals in byproducts.[74] In the late 1920s and early 1930s, Standard Oil acted on the API's guidelines to make operations more efficient and less wasteful, taking proactive efforts towards reducing oil pollution. Refiners recognized that oil in their waste streams represented potential revenue lost, and saw new technologies as an opportunity to increase efficiency.[75]

By the 1930s, refinery waste reduction became an important company program at Standard Oil. In instituting crude conservation practices at its refineries,

SONJ incorporated several tactics: it integrated more waste-saving technologies in refinery operations, educated its employees on waste-saving practices and the value of industrial conservation, began formal oversight of conservation issues, and worked to educate the public about its conservation practices in the aftermath of refinery accidents when pollution occurred. From the early 1930s through 1960, SONJ assimilated these procedures into its operations.

In the 1930s, the company began instituting more technologically efficient methods for reducing wastes. The *Standard Refiner*, a company newspaper focused on company refineries and refinery employees, covered waste recovery in both written content and illustrated cartoons. An article from 1932 describes how refiners were using oil separators to capture gasoline from wasted fuel gas. Refineries used crude oil not only to make products, but also as a source of energy for running machinery, burning the heavier fractions as fuel. Refiners at Standard Oil created technology to recover a small amount of gasoline from refinery waste gases using a debutanizer to separate the different molecules, thus recovering saleable product from waste streams.[76]

In July of 1939, Esso began formal anti-waste programs at the two refineries, as technical analysis had revealed significant waste issues at both the Bayway and Bayonne refineries. The program's objective was to "rid the plants of unnecessary expense" and encourage "elimination of wastes."[77] On average, Bayway and Bayonne used an impressive amount of raw materials on a daily basis, especially water. In 1939, Bayway pumped 90 million gallons of salt water and Bayonne pumped 38 million from New York Harbor every day, incurring costs of $143 million and $80

million, respectively, per year. The numbers for fresh water usage are less, but still significant; Bayway used 1 million gallons and Bayonne used 2 million gallons of fresh water provided by the city each day. Bayonne's costs were more than double Bayway's, $147,500 versus $60,000, for fresh water. But Bayway had a resource that Bayonne didn't have. With the property sandwiched between two inter-tidal creeks, the Morses Creek and Piles Creek, Bayway had access to fresh water, using an additional 2 million gallons of it daily for a much lower cost of $30,000 annually. Both refineries viewed lowering these costs, and consequently conserving water, as an important part of their anti-waste programs.[78]

In the 1940s and 1950s, crude conservation programs were aimed at controlling continued pollution problems, especially at the Bayway refinery. Bayway often fell short of crude conservation expectations. Between 1947 and 1948, the amount of oil in wastewater at Bayway actually increased from an average of forty-eight barrels a day to fifty-five.[79] The Refinery Loss Committee's 1956 report suggests that conditions at Bayway and Bayonne continued to worsen. In the opening letter of the report, committee Chairman William C. Child wrote, "The situation at Bayway, and in finished product terminally at Bayonne, is not good."[80] In his letter summarizing the committee's meeting, Bayonne and Bayway stood out as particularly culpable for significantly higher levels of pollution. Though he mentioned that Bayonne had taken steps to reduce these losses, Child cautioned, "The reasons for the increase in loss at Bayway from 0.85% in the first six months to 1.91% in the last half of 1955 are largely unknown. This indicates the need from considerable field study and possibly additional measurement facilities to permit the

sources to be largely isolated and corrected."[81] Child estimated that Bayway could save approximately $1.65 million a year on reducing oil wastes, and therefore reducing pollution at Bayway was crucial. "Bayway," he asserted, "should be encouraged to proceed promptly on such progress."[82]

Likely in response to continued pollution problems, Bayway created the Conservation Control Division in April 1957, whose "primary function is to pinpoint loss sources and initiate corrective action."[83] The division consisted of fourteen refinery employees called coordinators, each with a specific role to play in coordinating conservation efforts. The coordinators would "check loss sources in the sewer systems, in the flare systems, as well as pump gland leakage, safety valve leaks and spills," in addition to "contacting the public and investigating odor, noise and pollution complaints."[84] The Oil Conservation Division also facilitated the monitoring of oil and oil products as it moved through refinery processes in an effort to keep track of losses. The coordinators were also responsible for maintaining and turning in receipts and gauge measurements to the refinery's Business Service Department, where the Oil Movement Division could then analyze the reports in order to "locate of correct the trouble."[85] However, there was still some room for error, as any losses below the limits of "1/8-[inch] difference in gaging and 0.1°F in temperature" were not investigated.[86]

The short report generated by the Conservation Control Division at Bayway revealed how the methods of crude conservation were applied across the refinery's operations. The division's coordinators were divided into five units that referred to different refinery functions. In the conservation division, coordinators looked for

"unreported" losses, tried to locate the sources of those losses, took action to mitigate the problem, and also "investigate[d] air and water pollution." In the measurements unit, they took exacting measurements of "bulk receipts and shipments on tankers & barges," regularly checking these measurements and created data needed for testing. Another unit was devoted to conserving heat across the refinery. Another was tasked with the "conservation of air, water, steam, & electricity."[87] Then the loss coordinator combined data from the other four units in order to create a full picture of refinery conservation efforts.

The crude conservation efforts at Bayway in the late 1950s echoed efforts at other SONJ refineries. The Baton Rouge refinery in Louisiana had an Oil Conservation Division and practiced a variety of techniques to reduce refinery losses, including incorporating new technological methods. In checking equipment and processes across the refinery, workers at Baton Rouge used a "portable anemotherm" to "measure vapor loss from safety valves and disengaging drum vents," as well as a "gascope" to "measure % hydrocarbon in air" and "explosivity" among other instruments.[88] These technologies and others were employed across SONJ's refineries in efforts to reduce refinery wastes.

SONJ also worked to educate employees about the value of good maintenance and waste reduction between 1930 and 1960. Cartoons, such as Figure 7, impressed upon readers the value of reducing leakage in pipes and demonstrated the potential financial losses from even small escapes of petroleum. Refiners worried that "Little Drops of Oil" would add up. Such concerns reflected not only the increasing economic pressure of the Great Depression, but also the Progressive paradigm of

mechanical efficiency that drove technical improvements.[89] Figure 7 represents how the values of crude conservation had reshaped refinery practices. The cartoon is divided in seven horizontal panels, each representing a unit of time. In the first section, a worker comments to another that there is a leak. The other worker doesn't feel that a small leak in a pipe is a pressing problem and responds, "Only a drop—we'll fix it sometime when we get to it." The following five panels show how that little leak, left unplugged, adds up to a large amount of oil, using scientific measurements to illustrate the point. According to the cartoon, after a minute the drop could become one-tenth of an ounce. Then, after an hour, it would grow to six ounces. After a day, a gallon and a pint would be lost. After a week, eight gallons, and finally after a month, thirty-four gallons could be lost. Understanding a leaking pipe through the measurement and calculation of losses over time reflects the ways that the Progressive ideals of scientific management and workplace efficiency came to be applied to waste management within the refinery. Technical expertise and scientific measurement identified and revealed the consequences of worker ignorance. Here, what may have been a passing concern became a serious problem with significant consequences.

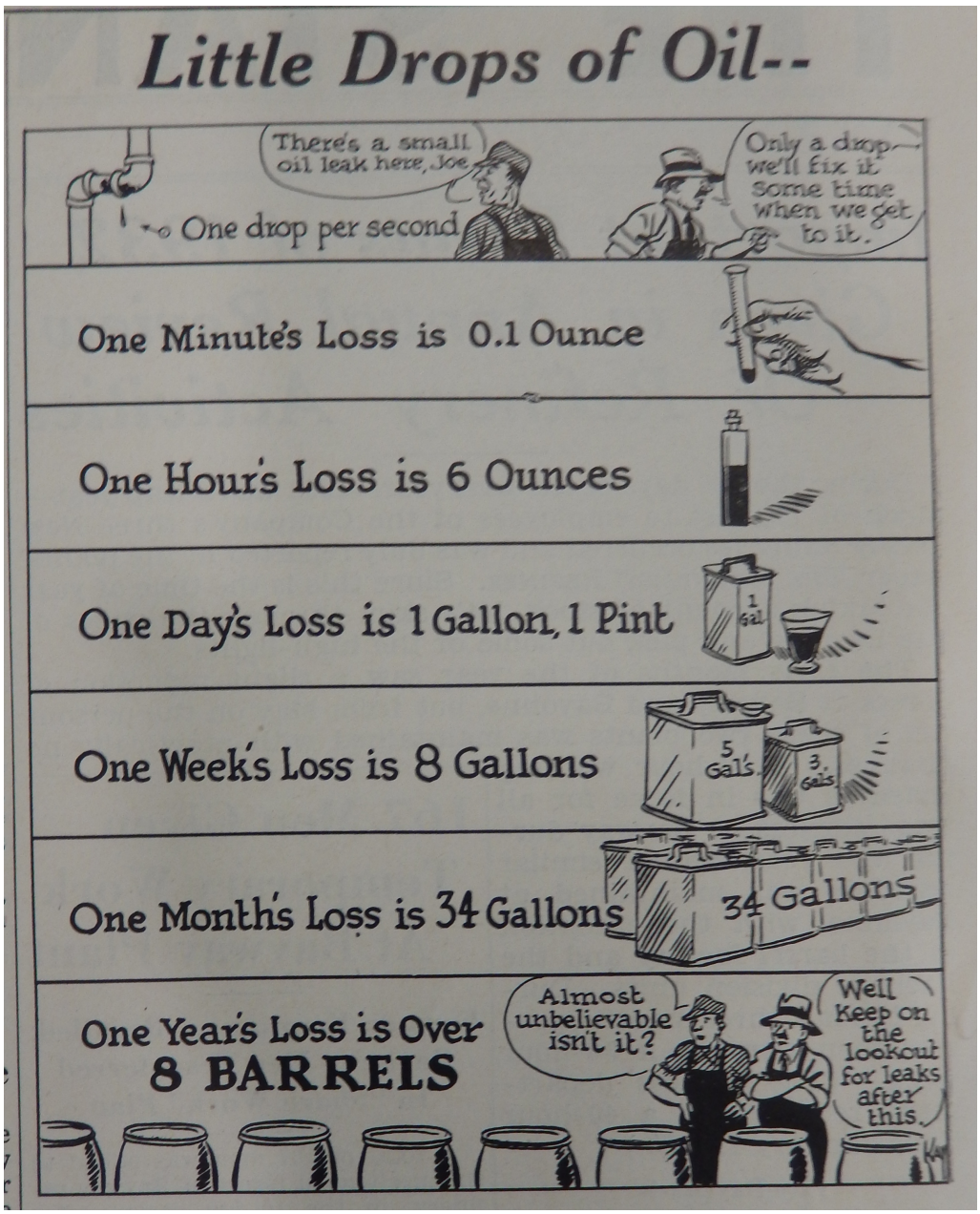

Figure 7 - This cartoon is one of the first of several cartoons published in SONJ publications throughout the 1930s and 1940s that attempted to educate employees on waste-saving tactics. It epitomizes Progressive ideals of efficiency, and promotes technical expertise as the right way to conserve wastes. "Little Drops of Oil," *'Standard' Refiner* 5, no. 1 (January, 1933), Box 2.207/93A, Exxon Mobil Historical Collection, Dolph Briscoe Center for American History, The University of Texas at Austin.

Standard Oil's Bayway workers were instructed to reduce wastes across the refinery. They were to look out for not only leaking petroleum, but also any type of wasted resource or material. At Bayway, signs were posted along Brunswick Avenue and posters were pasted across the refinery grounds to encourage employees to

conserve water, air, steam, glue, acid, and other things like pails. In a company competition in 1939, employees submitted 126 ideas for conserving materials. Several proposals simply called for picking up unused construction materials after the completion of refinery building projects.[90]

During the 1940s, Bayway and Bayonne continued this effort to educate workers about the problems of waste and inefficiency. In Figure 8, Will Duwright and Otto Nobetter demonstrate another cautionary scene at the refinery—cartoons that illustrated the *Esso Refiner* throughout in the 1940s. In Figure 8, Will Duwright watches in horror as Otto Nobetter—their names a word play echoing the message of the cartoon—bumbles his way around a naphtha-processing machine. In the first panel on the top left, Otto Nobetter exclaims, "Too bad you haven't got a bobby pin on you but my bubble gum will do. I don't need a lot of fancy packing materials to keep baby going. I'm a genius at this stuff, Will."[91] To Otto, technical materials are unnecessary to make repairs. You just need a little ingenuity. However, Otto's chewing gum failed and the second panel shows the dramatic results of his error as naphtha rushes out from all angles of the machine. Otto represents the way of doing things at the refinery before waste measures were put in place. He is the opposite of industry conservation of resources and Progressive efficiency. Will, in the bottom left panel, then admonishes Otto. If he was such a genius, why was so much naphtha escaping down the drain? In the last panel on the bottom right, Will reprimands Otto: "I suppose you don't realize that for every ten barrels of gasoline that gets into the sewer only two barrels are recovered at the separator." Will's point here is built on two assumptions. First, refinery workers needed to change their practices in order to

reduce wasted raw materials. Second, technology could intervene to lower the amount of effluents in wastewater. However, it ultimately could not recover all of the spent oil. Crude conservation could only go so far.

Figure 8 - Decreasing waste was an important piece of company policy at Bayway and Bayonne. "Otto Nobetter and Will Duwright" appeared in bi-weekly editions of the *Esso Refiner* in the late 1940s. The cartoons depicted scenarios in which Otto's laziness or shortsightedness led to wasted petroleum. Fortunately, Will Duwright was always there to catch his mistakes. "Otto Nobetter and Will Duwright," *Esso Refiner* 21, no. 21 (October 21, 1949): 7, Box 2.207/D94C, Exxon Mobil Historical Collection, Dolph Briscoe Center for American History, University of Texas at Austin.

Like Bayway, SONJ's Baton Rouge refinery carried out public awareness campaigns aimed at its employees in order to educate them on the value of crude conservation measures. Figure 9 is an example of a sign from the Baton Rouge refinery that focused on lowering escaping oil through the separators. Located near the main entrance to the refinery facilities, the sign declared to all who entered that refinery losses were a major priority. In 1958, the refinery was losing approximately 2,700 barrels of oil per day; nearly 1,500 barrels escaped through the oil separators. In an effort to reduce this number, refinery employees were encouraged to combat leaks at every stage of the refining process. The "slop thermometer" depicted here has a goal not of eliminating oil in wastewater, but of decreasing it to 1,000 barrels a day. While this may not have been a final goal, it suggests the difficulties refiners had in reducing oil in wastewater, and the impossibility of removing all of the oil from wastewater.[92]

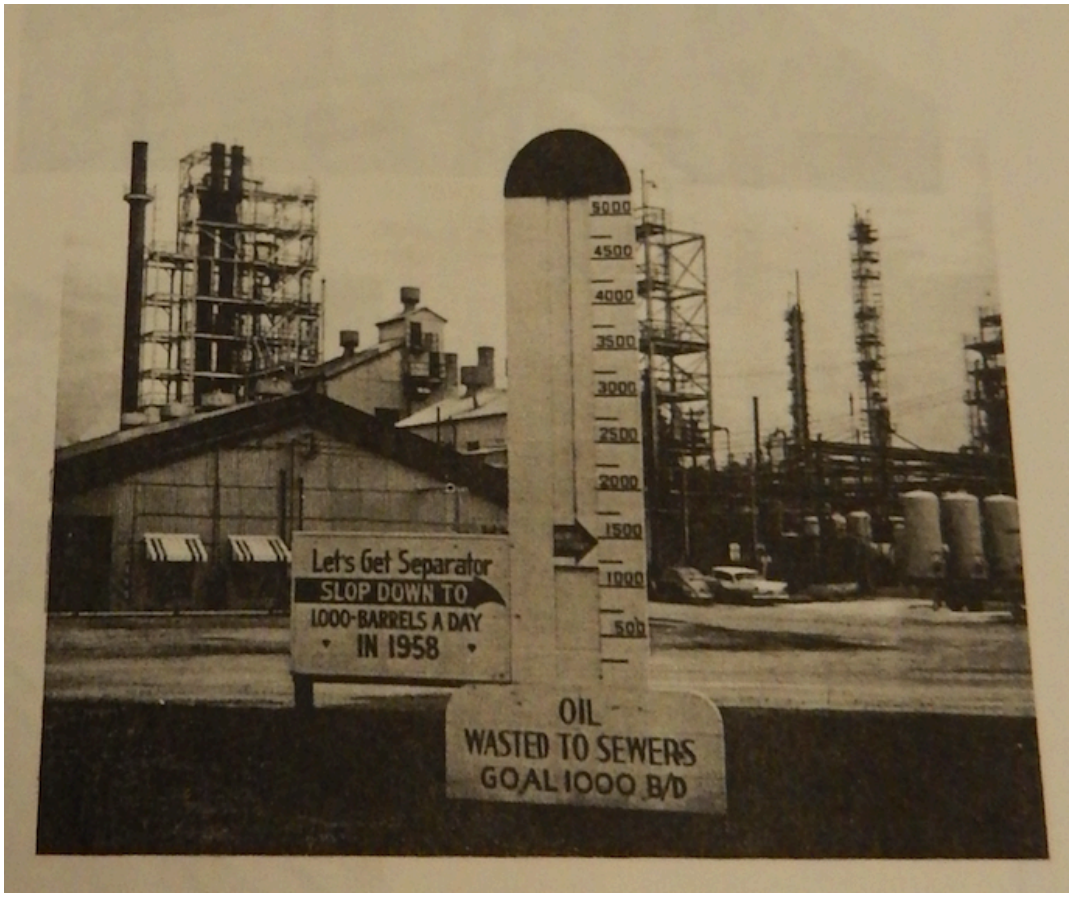

Figure 9 – This image depicts a sign posted along a refinery road in 1958. The sign was intended to inspire employees to conserve crude. Oil Conservation Division Baton Rouge Refinery, "Pollution and Loss Control: Publicity," January 1959, 9, Box 2.207/G84, Exxon Mobil Historical Collection, Dolph Briscoe Center for American History, University of Texas at Austin.

At SONJ, oil pollution was understood as "refinery losses" and thus represented potential lost profit. Consequently the company monitored refinery losses with as much specificity as possible. In 1930, SONJ created a Refinery Loss Committee, which held meetings annually through most of the twentieth century. Committee reports detail campaigns to lessen waste at SONJ facilities and the persistence of waste problems in refinery operations.[93] SONJ's Oil Loss Prevention Division estimated that refinery losses could be valued anywhere from $32-75 million in 1950 across the corporation. A study conducted by the Oil Loss Prevention Division in 1953 surveyed thirty-nine affiliates of Standard Oil for statistics about

their lost petroleum and the methods they used to combat it. The report, although detailed, was inconclusive. To determine how much oil was lost during production, transportation, and processing, the committee compared the amount of oil that was "unaccounted for" with the "total losses" from each of the affiliates. There was a $30 million difference between the two numbers. In 1949, there were 75 million barrels of oil, approximately 3 percent of the supply that was unaccounted for, compared to 32 million in accounted-for losses. The report lamented, "It was noted that the reported losses accounted for only 50% of the unaccounted for oil in Jersey's operations."[94] In 1950, there was $69 million in unaccounted-for oil, 2.6 percent of the total supply.[95]

Even though refinery losses seemed staggering at midcentury, SONJ recognized that refineries had significant potential for improvement in reducing refinery losses, and refineries provided the best data tracking losses. The Oil Loss Prevention Division's 1953 survey explained, "The greatest degree of coordination in loss reduction activity was in the refining function."[96] In the past few years, refineries had increased their awareness of industrial conservation issues and begun programs to reduce wastes. In 1953, sixteen out of nineteen SONJ affiliate refineries had created their own refinery loss committees and waste management organizations to address crude conservation, and the remaining three were encouraged to do so.[97] These reports for individual refineries detailed where most, but not all, oil was lost during the refining process. The authors suspected this might have been because refineries kept more detailed records about losses than about producers or pipelines. Even so, Standard Oil's refineries accounted for losses of approximately 17,000 barrels per day

in 1949 and 21,700 barrels per day in 1950, 24.9 and 34.3 percent, respectively, of all crude oil processed.

The uncertainty about oil losses and the results of oil-reduction tactics is palpable in the Oil Loss Prevention Division's 1953 survey. "Differences in methods of measuring calculating and reporting oil losses between functions and between affiliates," the authors attested, "raised a question as to whether or not the figures reports represented the true losses."[98] If practices varied widely across their affiliates, could these numbers be trusted? The report continued, "These differences, plus differences in operations and equipment, would not permit valid conclusions to be reached by inter-company comparison of the reported losses."[99] The report was hesitant to recommend any broad-based conclusions about company-wide refinery loss practices or statistics in the face of uncertain data.

SONJ's Refinery Loss Committee also recognized the importance of public relations in mitigating environmental problems, and tried to convince local officials that it was working on solutions to environmental problems. Not only was shaping the company's corporate image with nature an important goal of the Public Relation's Department, coordinators in Bayway's Conservation Control Division played an important role in mediating public contact with the refinery on pollution issues.[100] In the late 1950s, the Bayway refinery worked to influence public understanding of air pollution from their refinery. In a 1958 report, the Refinery Loss Committee asserted, "Bayway Refinery carries out a year-round program—which is educational in nature—in an effect to appraise the municipal and state officials, as well as the neighboring public, of our activities and progress in the field of air pollution

control."[101] The report outlined how Bayway officials kept "a close working relationship with local and state health officials," as well as local organizations like Chamber of Commerce committees. The refinery held meetings throughout the summer of 1957 in which refinery officials "presented an overall picture of our refinery operations, our past, present, and future outlook on refinery air pollution control and a digest on how we organized our refiner for these efforts."[102] Local and state officials attended these meetings, including state and US senators and congressmen from New Jersey and New York, New Jersey State Health officials, Interstate Sanitation Commissioners, and local municipal officials and groups whose work concerned pollution. In holding these meetings, Bayway hoped to present itself as a company that was working to solve local environmental problems.

Even at the local level, presenting themselves as experts on oil pollution problems became a crucial part of SONJ's crude conservation strategies to address public concerns. For example, in the fall of 1957, the Oil Conservation Division mediated concerns about air pollution from local officials and residents living near Bayway. A catalytic cracking unit had malfunctioned and sent spent catalyst into the air that then rained down on the nearby city of Elizabeth, New Jersey. In situations like this, the Conservation Coordinator was "performing a public relations function and the rapidity and efficiency with which he handles the complaint is a great asset to our community public relations program."[103] The coordinator "makes a preliminary survey of the affected area, communicates with the city officials, NJ State Health Department and local newspapers, notifying them in this case of our refinery unit upset with caused the local 'catalyst and soot' fallout on the city."[104] In actively

addressing the consequences of malfunctions in refinery equipment, Bayway hoped to appear to the public as proactive in addressing pollution issues. Bayway's Oil Conservation Division recognized in its public relations programs the continued possibility of events like the cloud of soot covering Elizabeth. By midcentury, crude conservation practices officially included public relations messaging tied to narratives of refinery expertise and progress on pollution.

By the 1920s, Standard Oil could no longer avoid the problems created by oil pollution. Since the 1870s, Standard Oil had begun using the waters of New York Harbor as its private dumping grounds. Nearby residents and local officials from New York City resented the degradation of their waterways. In the meantime, women's clubs, fishermen, resort owners, beach-goers, and other groups whose lives and livelihoods revolved around the use of coastal waters encouraged state and federal governments to support robust legislation to get oil out of the water. Their efforts came to a crescendo in the debates leading up to the Oil Pollution Act of 1924.

Antipollution activists argued for strict oil pollution regulations that restricted both land-based refineries and oceangoing ships to effectively eliminate oil pollution. However, their inability to engage with the technical specificity of oil industry representatives put them at a significant disadvantage. In addition, the oil industry had worked with the Bureau of Mines to shape not only how the government approached the oil pollution problem, but also the knowledge available on the subject. In response to the NCAPL and others, representatives from the oil industry and Standard Oil made several arguments against regulating land-based plants, most of which were bolstered by their ability to marshal technical evidence. The company argued that

eliminating oil pollution was impossible, and that regulations would be too costly for refineries to operate. Representatives from Standard Oil and the American Petroleum Institute also worked to convince lawmakers that oil pollution was a technical problem, and that the industry, not the legislature, was best qualified to solve it. The industry framed itself as a technical expert ready to address pollution, as long as refineries remained unhampered by federal regulations.

What emerged from the 1924 debates was a law that in practice did little to lower pollution but eventually reshaped how refineries thought about waste. Between 1924 and 1960, Standard Oil practiced crude conservation at the Bayonne and Bayway refineries. The refineries instituted programs to combat waste of crude oil, finished products, and other valuable materials in all aspects of refinery operations. Refineries adopted Progressive ideals of technical efficiency in addressing the pollution problem, beginning in the late 1920s. Oil pollution, SONJ and the oil industry as a whole asserted, was a technical problem with a technical solution. While the main goal was to cut costs and conserve crude, refineries enacted principles that indirectly worked not only to reduce pollution, but also to quantify losses of raw crude. Even so, data from SONJ's Refinery Loss Committee suggests how difficult instituting these practices actually was. As refineries like Bayway and Baton Rouge adopted practices of crude conservation, they faced challenges in reducing oil pollution. Technical instruments and programs at both refineries helped to monitor wastes, while refinery coordinators also addressed community concerns about pollution. Even so, through midcentury, the Bayway and Bayonne refineries remained significant contributors to local environmental degradation.

By the late 1950s, SONJ had standardized practices of crude conservation across refinery affiliates. In practice, crude conservation reinforced the idea that refineries and the oil industry in general were actively working to reduce petroleum pollution. What mattered most was that the oil refineries solidified their position as experts in order to continue to shape the discourse on petroleum's environmental effects.

Chapter 3

Petroleum's Park, 1900-1960

On June 7, 1923, Florence A. Tait, wife of the mayor of Englewood, New Jersey, wrote to John D. Rockefeller Jr. She feared that her home, situated on 300 scenic acres along the Palisades of northeastern New Jersey, was about to be destroyed. She lived in a place she treasured for "its great natural beauty and historic interest [that] have combined with 'the lay of the land' to protect it from encroachments of industry and preserve it for quiet homes and other means of refreshing contact with nature at her best." Tait perceived the cliffs as natural beauty, and believed they were something worth protecting. Even though the cliffs had a history of industrial use, Tait focused on the idea that a pristine and natural environment existed at the Palisades. She valued the cliffs and the scenic views of the Hudson River but for over a decade, Standard Oil of New York (SONY) had been gobbling up neighboring properties. Tait worried that the company's expansion threatened her bucolic sanctuary. The oil company's plans were "not reassuring," she wrote, particularly "in view of conditions at Bayonne and Elizabeth." In her view, the oil industry "had never been able to eliminate entirely the nuisances incident to its operation."[1]

Tait was right to reach out to Rockefeller Jr. about her fear of the destruction of the Palisades. In the early 1920s, SONY was using property along the Palisades as a storage facility, containing oil tanks and a loading dock, although company officials maintained they had no plans to further develop the site.

Rockefeller Jr. shared her concerns about the Palisades, a place he was determined to preserve. In correspondence with Tait, Rockefeller Jr. remarked that both he and his father "believe that the region should be preserved for all time, if possible as an essentially residential and recreational area."[2] He had not heard of any SONY development near the Palisades and was equally distraught. Consequently, Tait's letter provoked a swift and passionate investigation into her concerns. Rockefeller Jr. wrote immediately to H. C. Folger, chairman of the board of SONY, demanding information about SONY's plans for the river. He charged, "It is unthinkable that a company in which father's family is the largest stockholder should participate in violating the natural beauty of one of the most picturesque and healthful sections of New York State."[3] After a few months of investigative correspondence, Rockefeller replied to Tait that he had confirmation that SONY had no intention of building a refinery or manufacturing facility on these properties.[4]

Knowledge of environmental degradation at the Bayonne refinery informs Tait's concerns that oil refining destroys natural environments. Located approximately thirty miles south of the southern end of the Palisades Park, these two refineries contributed to the degraded environment of New York Harbor. During the 1920s, oil pollution in coastal waters became a national issue, culminating in the Oil Pollution Act of 1924.[5] Tait feared that her home in Englewood could suffer similar environmental ruin. However, landscapes affected by oil are not always transformed into desolate environmental wastelands.[6] As in the case of the Palisades, landscapes can be protected from those more obvious signs of influence and shaped by oil in more subtle ways. Even though, as Rockefeller verified, no oil refineries would

physically be built on the Palisades, by 1923 oil had already left its mark on the cliffs through the construction of the Henry Hudson Drive and the Palisades Interstate Park Commission's plans to build an even bigger road, the Palisades Interstate Parkway. These structures would undoubtedly change how locals like Tait experienced their hometown and the cliffs they loved so dearly.

Tait's alarm about the SONY property also illustrates the tensions over land development evident in much of the park's history. Park commissioners, politicians, philanthropists, and public citizens all vied to have a say in what happened at the Palisades. In the park's early history, concerned locals halted quarrymen's industrial development of the cliffs to prevent their destruction and created a park there to protect the Palisades. However, in stopping the quarries from being built, the park condoned another type of landscape development—turning the cliffs into a modern park, accessible and best traversed by automobiles. The history of the Palisades Interstate Park, and the parkway built within it, demonstrates the complicated consequences of the penetration of oil into the everyday lives of Americans and their environments.

Environmental historians have investigated how infrastructure projects like highways and pipelines facilitated both the production of petroleum products but also their consumption.[7] As Paul Sabin puts it, "Energy intersects with virtually every aspect of our economy and social organization, so energy policy often is made in unexpected places."[8] Sabin and other historians' work demonstrates that decisions about oil infrastructure are often made not just at federal or state levels, but also at different and sometimes competing levels of influence.[9] At the Palisades, private

philanthropic interests intersected with the goals of an interstate agency. The result is a park landscape shaped by oil.

By looking at the roads in the park, we can see the ways in which oil seeped into landscapes once imagined as pristine. Oil played a significant role in park development. This chapter investigates the connections between petroleum and the park through the actions of John D. Rockefeller Jr. and the local and regional planners who shaped the park in its current form. The chapter argues that its roads, rather than its cliffs, best define the Palisades Interstate Park. Over the course of the first half of the twentieth century, local planners, the Palisades Interstate Park Commission (PIPC), and Rockefeller Jr. himself reshaped the Palisades into a motorist's paradise. Over time, park roads evolved from meandering cliffside drives to a multilane parkway that became, in essence, a commuter highway. The use of gasoline and the building of roads for automobiles were controversial at times, but eventually car roads came to define the experience of being at the Palisades for millions of visitors. Most of these planners, commissioners, and philanthropists hoped to protect the Palisades in perpetuity. The irony here is how the idea of protecting natural spaces accompanied their development.

A dedicated conservationist, John D. Rockefeller Jr. worked to save majestic landscapes at the Palisades and across the country in places like Acadia in Maine, the Grand Tetons in Wyoming, and the Great Smoky Mountains in Tennessee and North Carolina. Interestingly, he did so without abandoning the idea that oil was inherently good for society. As the son of America's most important oilman, Rockefeller Jr. was unable to fully extricate himself from the industry that created his family's wealth.

Even though he stepped down from a position in the oil industry in 1909 and devoted most of his life to managing his family's philanthropic endeavors, he embraced the use of petroleum and the automobile. Rockefeller's actions helped to integrate the use of the automobile within park landscapes. He made his parks, especially the Palisades, landscapes where roads shaped visitor experiences. By collaborating with the park's commissioners on road building and eventually requiring the PIPC to build the Palisades Parkway as a condition of a gift valued at nearly $20,000,000 dollars, Rockefeller Jr. helped to transform the Palisades.

This chapter tells this story about roads in a park first by analyzing the fight to save the Palisades in 1890s, exposing that oil money underwrote the park's creation. Then, roads became a major part of park development in the 1910s and 1920s. These plans culminated in Rockefeller Jr.'s major land donation to the park with the specific stipulation that the funds be used to create a major scenic parkway where motorists could leisurely take in the park's vistas. However, plans for the parkways stalled until after World War II, when, in 1947, parkway construction began to reshape the Palisades. Though not without controversy, the parkway opened in 1958. Some locals, like wealthy socialist Corliss Lamont, criticized the parkway for its location within the park. Though plans for a major road in the region helped to "save" the Palisades four decades earlier, by the end of the 1950s many saw the parkway as a contributor to the region's urbanization.

The fight over park development was ultimately a fight over oil's influence. Though oil refineries only fleetingly appear in this chapter, they are never far from the park. Physically, the Palisades Park is only fifteen miles north of Bayonne and

twenty-two miles north of Bayway. The connections between these two places are not just geographical. The marshes of Bayonne and Linden, New Jersey were sacrificed to the oil refineries, while areas like the cliffs at the Palisades were preserved from oil refinery pollution. The PIPC and John D. Rockefeller Jr. shaped the park to be a setting completely opposite from industrial landscapes, like Bayonne and Linden. Even so, they were unable to completely prevent oil from defining it. As the use of gasoline and the automobile reshaped leisure and transportation practices, oil's influence was made visible in the park's landscape. In the debates over how to save and how to develop the Palisades, a hierarchy of landscapes emerged.

The Palisades—a 20-mile stretch of igneous-diabase cliffs bordering the western edge of the Hudson River from Jersey City, New Jersey north to Nyack, New York—became the center of a clash between conservationists and industrialists during the second half of the nineteenth century. Though the cliffs have a longer industrial history—its timber harvested for centuries by European colonists and then American settlers—entrepreneurs established rock quarries to mine the stone on the face of the cliffs in the late nineteenth century. Development in New Jersey and New York increased demands for cut and crushed stone to build macadam roads, buildings, and skyscrapers.[10]

For a while, quarry work proceeded without much notice from locals in New Jersey and New York. However, technological improvements in quarrying machinery prompted local conservationists' concern about the destruction of the cliffside. Dynamite blasted away large chunks of cliff face. Steam operated machines crushed stone and moved soil at the base of the cliffs, breaking big stones into little rocks.

These new technologies accelerated excavation and magnified the scale of quarry operations.[11] Entrepreneurs, like brothers Aaron and George Carpenter, removed up to 1,500 cubic yards of stone daily, blasting into the volcanic rock edifice.[12] Figure 10 depicts the Carpenter Brothers' quarry, located approximately where the George Washington Bridge now stands. With the river in the foreground, the image depicts both the massive scale of the cliffside and the magnitude of the destruction the quarries created using machines and dynamite. The crumbled rock face on the left is a stark contrast to the diabase pillars of ancient volcanic rock that form the cliff's natural edifice. As described by a writer for the *Evening Post* on October 20, 1984, "The Carpenter Quarry is, of course, bare of tree shrub, or grass, but north and south of it the face of the Palisades is heavy in timber, now taking on the glorious tints of autumn, which adds so much to the rich grandeur of this incomparable scenery."[13] Quarry operations necessarily cut back the vegetation that lined the shores of the Hudson, making their operation more of an eyesore. The visual changes in the Palisades added to the nuisance of the noise of quarry operations.

Figure 10 - This image depicts the site of the Carpenter Brothers' quarry in 1897. In the late nineteenth century, images of industrial development were interpreted in two contrasting ways. Industrialists, entrepreneurs, and miners saw the quarry as a site of material progress and the production of wealth. Conservationists and naturalists viewed the quarry as an example of human destruction of the inspiring views of nature. The debate over the use of the cliffs north along the Hudson River continued into the 1920s. "Carpenter Brothers' Quarry, 1897," New Jersey Palisades Interstate Park Commission (website), (accessed October 31, 2016, http://www.njpalisades.org/stopLongPath.html.

The quarrymen soon faced opposition from those upset at the daily noise from the blasting of rock, as well as those who wished to preserve the scenic beauty of the Palisades. In the 1890s, conservationists, New York philanthropists, the Women's Club of New Jersey, and conservation-minded politicians worked to thwart the destructive actions of the quarries and protect the cliffs. Though lawmakers and concerned citizens debated whether a park was the best way to protect the Palisades, and various park bills failed to pass in the 1890s, public dialogue about the Palisades grew. In 1895, New Jersey Governor George T. Werts, who opposed the creation of a park at the Palisades, instead supporting local quarrymen, admitted "as a feature of natural scenery they are all together unique," and that "the beauties of the Palisades are enjoyed in equal or greater degree by the citizens of New York and they are

equally interested in their preservation."[14] His message was echoed elsewhere. An article in the *Evening World* from March 25, 1893 simply remarked, "Defend the Palisades from the quarrymen!"[15] Many concerned locals, such as Nyack resident James P. McQuaide, argued that a park at the Palisades would "preserve the scenery along the Hudson River."[16] McQuaide was vocal in his opposition of the quarries and wrote to Rockefeller asking for his help: "We, on our side of the River, are doing everything in our power, but we are none of us very influential men, and we must call upon our friends on the East side to do all in their power to help us."[17] Rockefeller himself wrote New York Lieutenant Governor Timothy Woodruff, exclaiming that the quarry owners committed daily acts of "vandalism."[18]

Primarily a conflict over class and culture, quarrymen and conservationists had competing visions for the social and moral utility of the cliff, their distinct perspectives based on changing ideas about the role of nature in society at the turn of the century. Quarrymen argued that the cliffs were an important economic resource and that their work did not mar the beauty of the Palisades.[19] They saw scenes like the image depicted in Figure 10 as an example of humanity's progress, not humanity's failure to protect scenic places. Their dedication to the cliffs' economic value countered an emerging trend to protect certain landscapes from industrial use.

The call to protect the Palisades echoed a burgeoning national movement to save majestic and spiritually moving landscapes from industrial use.[20] In an 1895 message to the New Jersey legislature, Governor Werts argued that the desire to protect the Palisades "is kindred to that feeling which prompted the preservation of Niagara, the Adirondacks, Yellowstone Park, Mount Vernon, Washington's

Headquarters at Morristown and other places of natural or historic interest."[21] Protecting the Palisades was a local battle that aligned with an emerging national sentiment that valued the inherent beauty of natural landscapes.

Between the 1880s and 1920s, women's clubs were a powerful source of support for the conservation movement.[22] As conservation debates emerged as a contentious political issue in the early twentieth century, residents of metropolitan New York and New Jersey continued their work to save the Palisades. Women associated with the club movement passionately lobbied legislators, wrote to newspapers, conducted public lectures, and encouraged other women to join the fight to preserve the Palisades. Specifically, the activism of the New Jersey Women's Federation was crucial to the success of legislative efforts to protect the Palisades.[23] When the group hosted the national Women's Federation annual meeting for the state in 1897, including a cruise to visit the quarries, one club member asserted that part of women's duty was to "conserve the beauties of nature."[24]

The 1899 election of Theodore Roosevelt as governor of New York was a tipping point in activism for the park, forcing unwilling New Jersey legislators to concede to conservationists and the Women's Federation. An avid outdoorsman and conservationist, Roosevelt's election provided the necessary political capital to the movement to set aside land in the Palisades and create an administrative body, the Palisades Interstate Park Commission, to protect and govern its development. The PIPC would "provide for the selection, location, appropriation and management of certain land along the Palisades of the Hudson River for an interstate park, and thereby to preserve the scenery."[25]

Though New York and New Jersey legislatures supported the PIPC in writing, they did not provide a sustained funding source for the organization. It has relied on outside funding for support throughout its history. Between 1900 and 1915, the Commission was busy securing additional land for the park, stopping other active quarries, and acquiring the necessary legal and philanthropic support to sustain the park's development.[26] George Perkins, President of the New York Commission for the PIPC, recruited the help of a number of wealthy New Yorkers: business contacts, notable philanthropists, and other wealthy progressives he thought would support the cause. His goal was to accumulate $2.5 million in private donations that could then be matched with state funds. $5 million was a useful nest egg for the young park. With that money, the Commission could purchase land, build facilities, and construct trails and roads. Perkins enlisted Rockefeller Sr. to support the park with an initial $500,000 donation, joining a number of notable philanthropists such as J. P. Morgan and Mrs. E. H. Harriman. The donations took over ten years to organize.[27]

At the time, Perkins could not have anticipated the kind of allies the Rockefellers would prove to be, but the Rockefeller family fortune and their penchant for philanthropy likely inspired his request for their support. Rockefeller Sr. championed charitable giving from early on in his business career. As his biographer Allan Nevins wrote, "He had not waited to become rich before he became generous."[28] The Rockefeller family also pioneered the tactic of donating large sums over time to single organizations; Rockefeller Sr. was the primary financial benefactor in founding the University of Chicago.[29] He donated over $1 billion to charitable organizations between 1917 and 1960.[30]

Perkins gained an irreplaceable ally in the oil magnate's son. John D. Rockefeller Jr. felt passionately about conservation.[31] Though he donated to many different causes over the course of his lifetime, Rockefeller Jr. used his financial and political power to support conservation efforts across the country. Between 1924 and 1960, he gave $40 million to conservation efforts at the national level. Among his beneficiaries were six national parks: the Great Smoky Mountains, Acadia, Yosemite, Yellowstone, Shenandoah, Grand Teton, and the Virgin Islands National Park.[32] In comparison, Rockefeller Jr. spent over $20 million to protect and develop the Palisades Park—over half of his cumulative donations to other park landscapes in the United States.[33] Likely motivated by time spent in the Palisades as a young man, exploring the cliffside on horseback, Rockefeller Jr. made it a priority to protect the Palisades.[34] Rockefeller also, when necessary, used his political and business connections to leverage support for these parks. In 1906, Rockefeller Jr. engaged in correspondence with politicians arguing in favor of extending the PIPC's powers to acquire land north along the Hudson River.[35] But perhaps most significantly, Rockefeller Jr. consistently used his family's wealth to conserve thousands of acres of land for public, state, and national parks.[36]

Wealth from the burgeoning oil industry made such conservation possible. John D. Rockefeller Sr. was founder of the Standard Oil Company in 1870. Throughout the late nineteenth century he purchased his own company's stock whenever possible, even buying out his former partner Samuel Andrews for $1 million in 1874.[37] Rockefeller Sr. bought Standard Oil stock frequently from other investors shoring up his power in the company and increasing his share of the profits.

Rockefeller Sr.'s personal worth rose to $900 million in 1912.[38] This was an incredible fortune in the early twentieth century and adjusted for inflation is about $22.5 trillion in today's money.[39] By the late 1910s, Rockefeller Sr. began substantial transfers of wealth to his son. By 1921, Rockefeller Jr. assumed the stewardship of the family's wealth and its public image.[40] At times, he directly used his wealth in oil company stocks to fund his philanthropic efforts.[41] When negotiating with the state of New Jersey to acquire a Revolutionary War site for the Palisades Park in the 1950s, Rockefeller Jr. reimbursed the state for its contributions with shares of Standard Oil of California stocks.[42] As benefactors to the PIPC, John D. Rockefeller Sr. and his son helped to save the Palisades from the quarrymen and other industrial threats by relying on their oil wealth. Money made from oil directly contributed to the conservation of the Palisades.

Oil not only shaped the park through the wealth it created, but also through automobile road building at the Palisades. Roads were part of the plan for the Palisades Interstate Park from the beginning and these plans fit within larger goals to build roads across the state. As early as 1904, State Engineer Henry Van Alstyne proposed the idea of a parkway in the Palisades, and the Highway Alliance, a group dedicated to building highways in New York, began promoting the idea. Originally, both envisioned the road as potentially beneficial for the military, giving the Army at West Point—the US military academy located on the Hudson River not far from the northern border of the park—direct access to a major road. The Highway Alliance's president, John B. Uhle, hoped that upcoming legislation would devote $50,000,000 to roads in the state, a portion of which would go to the Palisades.[43] The Highway

Alliance was likely aware that the State of New York was preparing a massive system of highways. In addition, Van Alstyne was, according to a letter from lawyer Charles Fay to Rockefeller's personal lawyer, Starr. J. Murphy, "most anxious that the Palisades Park Commission should carry out its scheme and have its road meet his road at Stony Point."[44] These state workers imagined that the Palisades Park would help to meet some of their road-building goals for the state.

In the first few years of the park's life, the state of New York, the PIPC, and Rockefeller Jr. himself began to put plans in motion to build a major road in the Palisades. The first version of this road became the Henry Hudson Drive. Plans from 1909 showed a "proposed Hudson Fulton Boulevard" at the base of the cliffs along the riverfront of the Palisades. The planned boulevard would start in Fort Lee, New Jersey and extend to Stony Point just south of the vast plot of land donated by Mary Harriman, wife of railroad magnate E. H. Harriman.[45] In published correspondence with Governor Hughes and Mrs. Harriman, Commissioner Perkins described his plan for the land added to the park in 1906 and 1909—a plan which focused on "constructing a roadway along the palisades."[46] Governor Hughes agreed, "[I]t is very desirable that a roadway should be built along the Palisades adding to the accessibility and use of this district and also forming a suitable approach to a highland park."[47] State employees, wealthy New Yorkers, park commissioners, and even the governor of New York all envisioned a future where enjoying the cliffs by motorcar was possible.

In building roads for cars, the PIPC participated in the changes that car ownership and gasoline consumption would bring to the park experience on a national

scale. In 1914, the Board of Supervisors of Orange County approved the construction of a highway on Storm King Mountain. They hoped their new highway would eventually connect with "a section of the inter-state Palisades Parkway running from Edgewater, N.J. to Newburgh, N.Y."[48] In addition, roads like the Henry Hudson Drive, completed in 1921, encouraged drivers to take leisurely drives along the shore of the Hudson and the base of the cliffs. Roads along the Palisades became so popular that the numbers of cars traveling the park's roads rose dramatically between 1916 and 1924, from 2,150 to 1,159,000 annually.[49] Officials at the Palisades also noted the connection between gasoline consumption and park visitors. When gasoline consumption was limited during World War II rationing, attendance to the park declined, rebounding only when the rationing was terminated.[50]

Developments at the park attracted drivers, though not without some criticism. Van Dearing Perrine was a landscape painter who rented an old chapel and schoolhouse in the New Jersey section of Palisades Park during the 1910s. He painted a number of scenes of the Palisades cliffs, all the while detesting the Commission's "improvements." Perrine once lamented to George W. Perkins (who often joined him for walks throughout the park), "If you *must* improve on nature, do it like a fox and hide your trail!" Perrine was disgusted by all kinds of developments, including stonewalls, one of which came all too close to Perrine's rented schoolhouse. He continued, "If I hadn't been tamed by this thing called civilization, I'd take a hammer and destroy these atrocities." Perrine's contrasts here between civilization and the nature of the Palisades demonstrate his assumption that the Palisades were an untamed landscape. Perhaps Perrine saw himself as a twentieth-century Thoreau

whose life in the Palisades wilderness inspired his art. While Perrine detested all of the PIPC's additions to the park landscapes, he particularly hated that cars were allowed inside the park. He hoped he would live to see automobiles banned from park roads. It is likely that had he known about the park's plans for a parkway, he would have been appalled.[51]

Perhaps hoping to counter critics like Perrine, the Palisades Interstate Park used photographs, posters, and postcards to excite drivers about the roads of the Palisades—a tactic being used by state and national park systems across the country. Nature tourism schemes were so successful that the automobile became the main mode of transportation for many Americans when traveling to parks, and the Palisades was no exception.[52] The postcard in Figure 11 is an example of how print media was used to encourage nature tourism at the Palisades. Including the automobile as a main feature of the image demonstrates the centrality of driving to experiencing the park. It is likely that drivers parked the car and took the photograph themselves, suggesting that the cliffs were themselves a tourist attraction. In Figure 11, a car approaches the viewer from around a sharp corner. The corner, made of a tower rock face, intimidates and awes the viewer. Two standing figures are almost indiscernible standing near the face of the cliffs—their figures almost merged into stone. The scene is both impressing and inviting. With a car, one could enjoy the majestic sights of the cliffs with ease and comfort. Perhaps drivers imagined themselves standing at the bottom of New York's skyscrapers when visiting the cliffs by car. They could stare straight up from their seats in awe of the heights, just as if they were driving down Broadway.

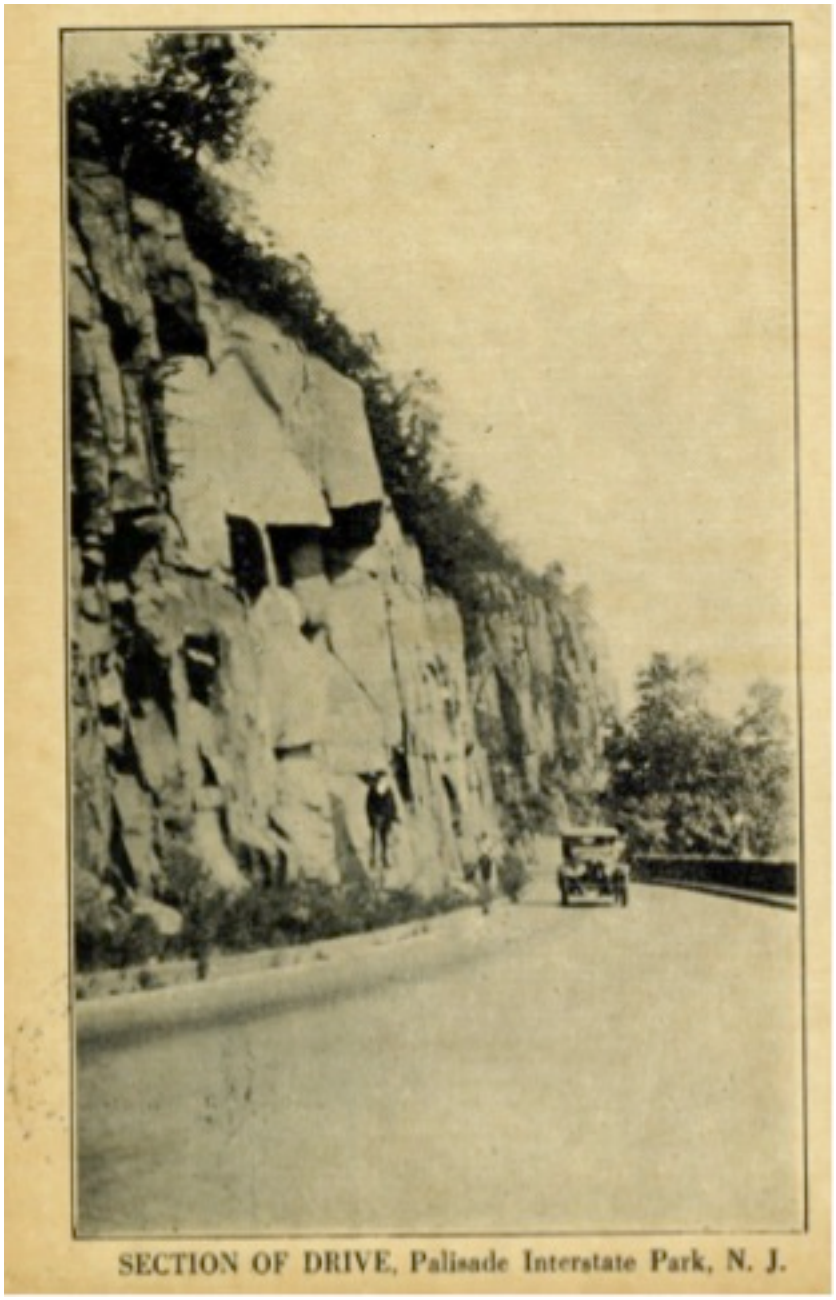

Figure 11 – Postcards, like the one showed here, epitomize how images of unique scenery were used to draw visitors to state parks. Here, the focus is on the accessibility of the Palisades by automobile. "Section of Drive, Palisades Interstate Park, N.J.," postmarked 1924, author's private collection.

However exciting a destination, building roads in the Palisades was no easy task, especially for a park without consistent state or federal funding. Private philanthropy, most significantly from Rockefeller Jr., made road construction at the Palisades possible. His father's initial $500,000 donation was contingent on a

confirmation of road building plans. In 1911, his office requested that the Commission confirm they had received the right to condemn land for roadways and parkways from the state of New York before donating the first 40 percent of his $500,000 gift.[53] From then on, George Perkins kept Rockefeller Jr. informed of road construction projects.[54]

Road building and acceptance of automobiles and automobile culture influenced how people understood their environment.[55] As automobile technology profoundly altered Americans' relationship with nature in the early twentieth century, Rockefeller Jr. became dedicated to including road construction in park development.[56] Rockefeller Jr.'s opinions were shaped during debates about how to build roads at Acadia National Park in Maine, where he was an important benefactor.[57] Because of this work, he developed a specific conservationist philosophy that favored the construction of roads. Even when he envisioned only non-motorized traffic, roads enabled visitors to explore a given park. In correspondence with Lincoln Cromwell, President of the Northeast Harbor Village Improvement Society in Maine, Rockefeller Jr. eloquently mused that he hoped the carriage roads would "make available, views of unsurpassed beauty and sections otherwise inaccessible, to the many who could not reach them except with horses, as well as to that also large number of people who find walking on roads more comfortable than the rougher and steeper trails."[58] Put simply, roads made it easier for people to experience the beauty of nature.

Bringing roads into parks was a tempting idea for many people who cared about preserving America's nature. Though many wilderness advocates fought

building roads in parks and wilderness areas, even John Muir, the famous face of early twentieth century preservationism and the founder of the Sierra Club, relented that roads could help preserve beautiful natural places.[59] As Donald Worster describes in his biography on the wilderness leader, Muir's defense of Hetch Hetchy included plans for "a grand circular drive" that would enable visitors to traverse Yosemite Valley and explore Tuolomme canyon on their way to Hetch Hetchy Valley.[60]

Though he embraced development more fully than Muir, Rockefeller Jr. also believed in the power of park roads to shape visitor experience. He believed roads, used to showcase and direct traffic through landscapes, would ultimately preserve nature rather than deface it.[61] Even further, he believed that roads, over the long term, did little damage to nature. In another letter to Cromwell, Rockefeller Jr. asserted his belief that roads simply do not do much damage to the landscape, and that paths and roads once abandoned merged easily back into nature. "Because I have built paths and roads almost since childhood and know how quickly nature obliterates the scars necessarily made at the outset," he wrote, "I have realized as perhaps few others have, that the conspicuousness of some of the newer roads would soon disappear and they would almost become obliterated…"[62] Roads, Rockefeller Jr. argued, were important and non-detrimental additions to natural spaces.

Rockefeller Jr.'s belief in the importance of automobile roads, rather than carriage roads, came from his experiences at Acadia. Though cars were forbidden on Acadia's roads, park authorities knew that many people ignored that rule and drove automobiles anyway. The question of whether or not to allow automobiles on Acadia's carriage roads was controversial, and Rockefeller Jr.'s own ideas evolved

during the debate. In September 1920, Rockefeller Jr. was firmly opposed to motor roads in the park. He wrote several letters that month, reassuring local people that he had no intention of building mountain-top roads or allowing cars on his carriage roads.[63] However, by the end of the year, he dramatically changed his tone. He wrote to George Pepper, lawyer, social activist, and opponent of motor roads at Acadia, outlining why he changed his mind. "That people who cannot walk or conveniently drive should be able to go to the top of one of the mountains seems to me not inappropriate or unreasonable," he wrote.[64] Cars, he thought, might replace carriages as the most convenient way to travel within a park.

Rockefeller Jr.'s convictions about building roads in parks only grew over time. In a conversation with family friend Kenneth Chorley in 1954, Rockefeller Jr. passionately asserted what had by that time grown into a fervent belief: "What are those parks for…? The average American can't afford to go into the secluded areas or to have private trips into the parks. He must travel on such a highway. That's the whole point of the national park system."[65] Rockefeller Jr. recognized that for many Americans, the most affordable and available mode of transportation was a gas-powered car.

Rockefeller Jr.'s dedication to road building mirrored the larger movement within local public planning circles to construct an efficient system of roads in the New York metropolitan region. The Regional Plan Association (RPA) published a plan for developing the city's transportation infrastructure in 1929 that relied almost exclusively on the automobile as the main mode of transportation, and they had a specific plan for the Palisades. The multi-volume proposal included an extension of

Route 9, an existing highway near the cliffs, called Route 9B that would be part scenic boulevard and part parkway, serving passenger traffic to the park. The RPA envisioned the route extending from Weehawken, New Jersey along the Hudson River to Haverstraw, New York. The plan charged, "The Palisades parkway can be designed so that it would be one of the most striking and attractive parkways in the Region."[66] The RPA even called for the expansion of the Park's holdings on top of the Palisades, and they feared that development around the proposed 178th Street bridge (what would become the George Washington Bridge) could destroy the "great natural beauty of the Palisades," mar the summit with construction, and decrease land values in the area.[67] The Palisades, though a park, did not preclude inclusion in the sprawling development of an auto-mobilizing America.

There was also a growing public sentiment that parkways were exciting and preferable to stale and monotonous highways. As Mildred Adams, a writer from the *New York Times*, dreamily wrote about the Palisades Interstate Parkway in 1933: "For the motorist, the promised parkway, like the present highway, will perhaps be the most beloved as a means of getting somewhere." To Adams, parkways added to the allure of driving for pleasure. She continued, "It is the quickest route out of the city, so quick that the magic of that sudden leap from town to countryside, without a single gas tank or garbage dump to mar the going, still takes the breath away."[68] A parkway in the Palisades would make it easier for New Yorkers to partake in the elegant cultural experience of exploring nature by car without actually traveling very far at all.

Roads determined the character of the Palisades, and building a parkway on the Palisades was a major goal of the RPA, the PIPC, and of Rockefeller. The PIPC had acquired 32 percent of the land needed for the highway by 1933.[69] Aware of and inspired by the Regional Plan Association's recommendations, Rockefeller Jr. began the complicated process of aiding the PIPC in making a parkway in the Palisades.[70] Between 1928 and 1931, he orchestrated a massive land-buying program, focusing his efforts on the part of the park adjacent to planned construction for the George Washington Bridge.[71] Aware of regional infrastructure plans and the inability of the PIPC to purchase pricey properties, Rockefeller Jr. invested his funds in the expensive real estate of northeastern New Jersey.[72] Plans for the bridge made land in New Jersey's cliffside towns more valuable, and land speculators rushed to gobble up properties for large luxury apartment buildings.[73] This made it impossible for the Commission to significantly expand parkland in New Jersey. It was just too expensive.[74] But it was not too expensive for Rockefeller Jr. and his incomparable wealth. He spent $21,158,475 buying properties in Fort Lee, New Jersey and other nearby towns, and then donated the lands to the PIPC.[75]

Rockefeller Jr.'s use of language in his 1933 donation letter speaks to the complex nature of park creation in the early twentieth century. "My primary purpose in acquiring this property," he wrote to the PIPC, "was to preserve the land lying along the top of the Palisades from any use inconsistent with your ownership and protection of the Palisades."[76] Ultimately, Rockefeller Jr. hoped to increase the size of the park and protect its scenic landscape. Yet he recognized that nature could be reshaped to that ideal. Most of the properties included in the donation were already

developed and had a variety of different types of structures built on them. He was not saving pristine, undeveloped landscapes—environmental historians contest landscapes devoid of human influence do not actually exist—but rather reshaping hybrid landscapes, or ones that already showed signs of human modifications.[77] The tops of the Palisades had been extensively developed since at least the mid seventeenth century. Loggers cut down its timber. Farmers planted and harvested crops. Builders constructed homes, schools, churches, and a variety of different structures there. Turning this land into the park meant revivifying it from a multi-use hybrid landscape into a reimagined wilderness.

Within this flexible concept of nature, Rockefeller Jr. saved a place for the parkway. The road was, in his mind, inextricable from modern experiences at the park and his intentions behind the donation were tied to this vision. "It has also been my hope," he wrote in that same letter, "that a strip of this land of adequate width might ultimately be developed as a parkway along the general lines recommended by the Regional Plan Association, Inc." [78] Rockefeller Jr. hoped that his donation and the RPA's road-building goals would make the parkway a good candidate for federal funds as part of the New Deal's National Industry Recovery Act.[79] Unfortunately, the parkway did not receive the funding and the Commission was unable to immediately raise the funds on its own. Even so, Rockefeller Jr. decided to donate the 652 acres of land to the Commission in 1935 on two conditions: that the land would be used solely for park purposes and that a parkway would be built.[80]

Ironically, Rockefeller Jr. never rationalized his push for the Palisades as being in any way related to increasing his family's wealth through expanding gasoline

consumption. He never saw road building as a way to sell more gasoline and increase his stock values in the oil industry. His biographer, Raymond B. Fosdick, asked Rockefeller Jr. why he was so interested in the Palisades during their conversations for *John D. Rockefeller Jr.: A Portrait*. Rockefeller replied, "It was such a beautiful place and I wanted to have it opened up so people could see it." Rockefeller Jr. was deeply influenced by the times he spent crossing the Hudson River by ferry and then riding on horseback through the Palisades in his youth. He continued, "These things have always given me a great lift and I think that had something to do with my desire to open up places like the Palisades so that people could experience the same satisfaction that I had in trees and landscapes and sunsets."[81] Rockefeller Jr. was genuinely motivated in his road building to increase people's access to inspiring and beautiful landscapes.

Rockefeller Jr.'s vision for a park whose scenic ideals and modern accessibility materialized as workers began construction on the parkway in 1947. Rockefeller Jr. guided the construction process, offering advice to the parkway's engineers. Specifically, he cautioned them against putting the road too far from the edge of the cliffs. He wanted drivers to be able to look both forward and from side to side.[82] He even suggested that chief engineer Ken Morgan travel to Acadia to see an example of the kind of road he envisioned for the Palisades. As Morgan wrote to Rockefeller Jr.'s son Laurance S. Rockefeller, "He suggested that we provide more lookouts and do everything we could to make the Parkway in the Jersey section a scenic one."[83]

Though Rockefeller Jr.'s motivations were genuinely aimed at park-goers' well-being, the parkway was controversial. Just before construction on the project began in the mid-1940s, local residents and other wealthy urbanites organized resistance to the construction of the Palisades Interstate Parkway. Perhaps the most famous opponent of the parkway was Corliss Lamont, whose family once donated $100,000 to the park.[84] Lamont, a prolific writer, radical socialist, academic philosopher, and local philanthropist who unsuccessfully ran for office several times in New York, penned a scathing article in the July 1945 issue of *Survey Graphic*, depicting the proposed parkway as a super highway whose automobile exhaust would congest the entire region. He wrote that "demon drivers" would descend on the Palisades' new "super highway" bringing the "fury and clatter of mechanized existence" to the Palisades. Lamont's characterizations of the automobile were similar to others', like socialist forester Bob Marshall and ecologist Aldo Leopold, who criticized roads and cars for marring natural landscapes. Marshall wrote in a 1930 article in *Scientific American* that in wilderness areas, "all roads, power transportation, and settlements are barred."[85] Though Marshall and Leopold advocated for the preservation of wilderness spaces, Lamont adopted similar language when arguing against the construction of a parkway in the Palisades and he charged that the automobile would degrade the landscape and the experience of being in the park.[86] Lamont argued that the parkway would "bring the sights and sounds—not to mention the fumes—of speeding automobile traffic close to the edge of the precipice."[87] Gasoline fumes and fast automobiles were a particular menace to

Lamont. This image of speeding cars teetering on the cliffside must have been particularly frightening.

Noticeably, Lamont's *Survey Graphic* article did not mention that the parkway would be closed to all vehicles other than passenger cars and instead presented the parkway as a massively destructive road whose presence would be undeniably negative. However, the commissioners saw through Lamont and his family's protestations as unwillingness to have such a road so close to their property. Robert Moses, the polarizing public official whose decisions to favor highway construction over public transportation reshaped the New York Metropolitan area, was often in contact with the PIPC and Rockefeller about the parkway. In a letter, Moses once wrote, "The Palisades need no saving at the instance of a phony like Lamont who never did anything for anybody except verbally, and whose mother told me twice that our Parkway should not be built because if brought people and traffic into the region where Corliss did his thinking."[88]

Even so, opponents to the parkway continued their push to stop construction and used several different arguments. First, they created materials that argued that developing the Palisades Park would destroy its natural beauty, not save it, as had happened in the first decade of the twentieth century. A booklet opposing the parkway was circulated in Bergen County, New Jersey. The cover asked "Why?" and displayed an image showing a sign exclaiming: "This area closed to the public. Palisades Interstate Park Commission." The cover image was intended to suggest that vast sections of desirable terrain would forever be closed to park visitors by parkway construction. The New Jersey Association for Parks and Parkways (NJAPP)—formed

mostly by local residents from Englewood, Tenafly, and Alpine—created the booklet, claiming that their sole purpose was "to support every effort to give the citizens of New Jersey essential parks and parkways."[89] It seems that the group existed just to fight the parkway project and chose a name meant to convey authority on a much broader set of public infrastructure issues.

The group also argued that the parkway was redundant infrastructure. This argument is crucial to the overall message of the promotional booklet from the NJAPP. Inside the front cover, the booklet's authors asserted, "We, therefore, believe that a parkway through this particularly priceless area is unnecessary, undesirable and contrary to the public interest for the reasons set forth in this booklet." To prove this point, the NJAPP argued that widening a current highway, Route 9W, on the west side of the park would be much more efficient and cost-effective. At $500,000, their plan was much less than the estimated $22 million it would cost to build the parkway.[90]

As part of their attempt to convince readers, the booklet contained a set of maps that highlighted their vision of which roads should and should not be built in New Jersey. As shown in Figure 12, the maps attempted to illustrate how unnecessary the Palisades Parkway was. In the map on the left, a fictitious set of possible parkway routes cross Bergen County in all directions. Though more highways would eventually be built in Bergen County, none of the ones proposed in this map were. Yet, in this context, the map demonstrates the group's supposed expertise in road planning even they do not include any driving statistics supporting the creation of any of the routes proposed. Below the left map, a description reads, "Competent Planners

recommend 5 basic parkways for Bergen County as shown on the above map." The assumption here was that the Palisades Parkway planners were incompetent and did not have the needs of the entire county at heart. The map on the right side of Figure 12 appears to show the proposed route of the Palisades Parkway. However, even this seemingly simple map has a pointed message. The only roads the map depicts are the proposed Palisade Route and its potential neighbor, Route 9W. On the map, Route 9W is drawn as a simple, thin, and unobtrusive line running north-south. In contrast, the Palisades Parkway route is drawn in a thick striated line, perhaps to indicate how much wasted parkland would need to be devoted to the road, while a three-lane highway already existed parallel to the route.[91]

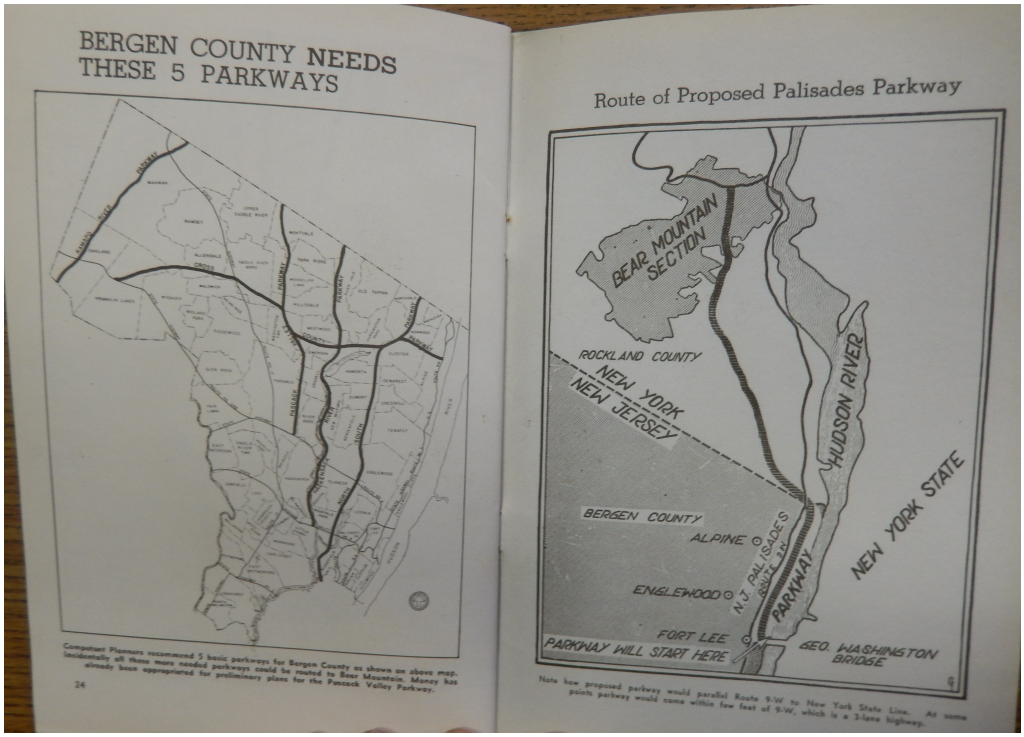

Figure 12 – These two maps comprised the back pages of "Why?"—a booklet that hoped to turn Bergen County residents against the Palisades Parkway project. The images assert the uselessness of the proposed Parkway and the assumed incompetence of the Palisade Parkway planners. "Bergen County Needs These 5 Parkways" & "Route of Proposed Palisades Parkway" in New Jersey Association of Parks and Parkways, "Why," 24-5, Palisades Interstate Park Commission Archives.

Despite the opposition, the Palisades Parkway became the most popular road in the park after its opening to motorists in 1958. The car, it seemed, was the best way to get to and through the park. Visitors by steamship decreased steadily as more families arrived by car, with only 213,000 persons arriving by ferry in 1958. The automobile was also responsible for the elimination of the Bear Mountain Stop on the West Shore Railroad in West Haverstraw, New York, which brought visitors to the park by rail.[92] In addition, many drivers used the new parkway as a convenient way to access the George Washington Bridge from lower New York State, west of the Hudson River.

Rockefeller Jr.'s vision of a park experienced by automobile is visible from the map in Figure 13, which shows the completed parkway and expanded parkland in 1960. Part of the parkway is the thin green line extending from the New Jersey section to the Bear Mountain section. The land acquired to connect these two areas of the park follows the plan of the parkway, signaling the road's important role in the park's geography. Without the parkway, visitors would be cut off from experiencing both the upper and lower sections of the park. The map shows the network of highways and parkways that spread across the tri-state region at midcentury like a spider's web. The parkway is only one thin, wavy line among a sprawling network of roads built to facilitate the movement of motorists and the exploration of regional landscapes.

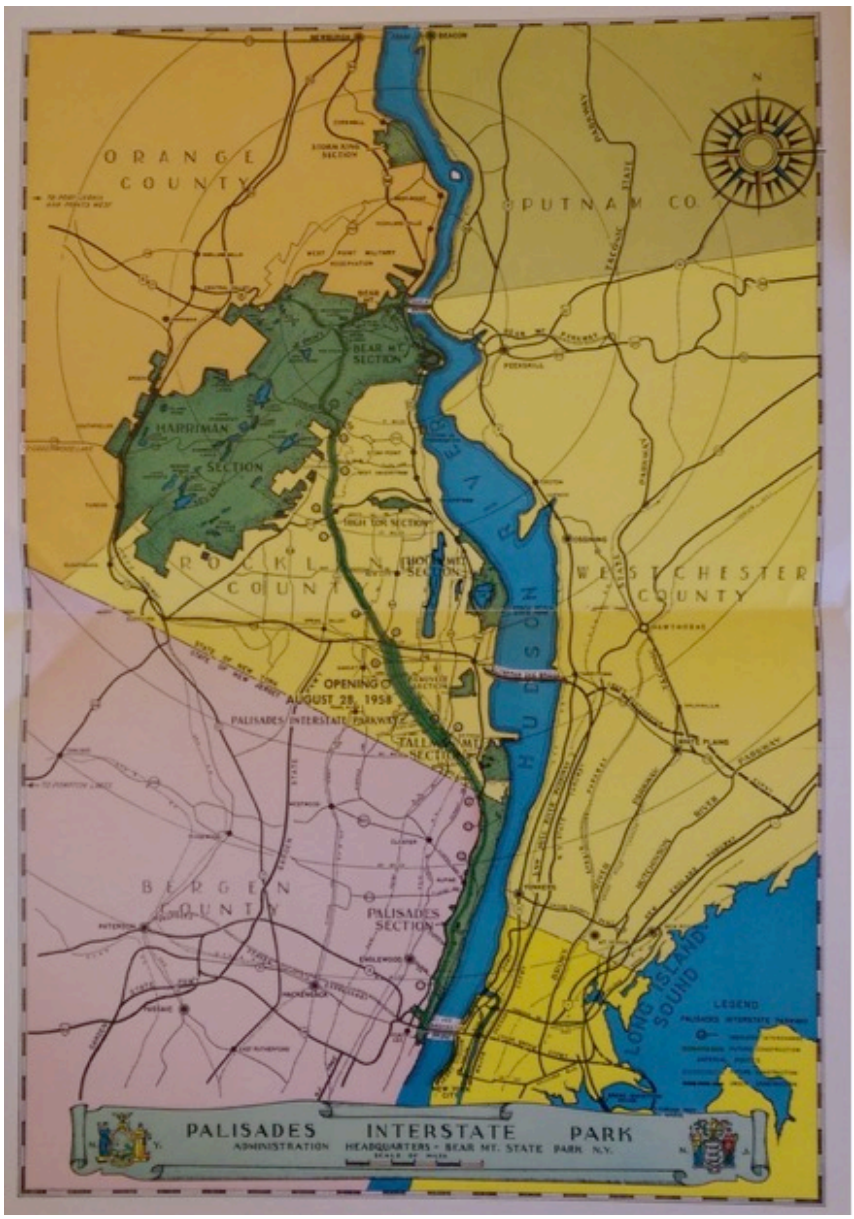

Figure 13 – This map shows the extent of the park and parkway construction (shaded in green) in 1960. New parkland surrounds the construction of the Palisades Interstate Parkway, the link between the New Jersey section of the park to Bear Mountain. *Map of the Palisades Interstate Park*, "Palisades Interstate Park Parkway Completion Story, August 28, 1958," Palisades Interstate Park—Palisades Interstate Park Commission—Reports and Printed Material, 1940-1960, Folder 1178, Box 133, Series E, Cultural Interests, FA314, Office of the Messrs. Rockefeller records, Rockefeller Archive Center.

The opening of the highway did not mean an end to the controversy. In 1959, Esso built two gas stations within a section of the Palisades Interstate Park in Englewood Cliffs, New Jersey. Protestors decried the construction of gas stations in

the park, as residents of Englewood Cliffs had been working with the town government since the 1930s to limit the number of local gas stations. After the opening of the George Washington Bridge in 1931, residents felt that liquor stores and gas stations had invaded their quaint cliffside town and protested the town's urbanization.[93] Opponents of the Palisades' gas stations took legal action to prevent gas stations from being built in the park, as well.[94] Unfortunately, there was little political will to support the protests. Englewood mayor Tom Glendinnin immediately contacted the Palisades Interstate Park Commission confessing that he had no knowledge of the injunction.[95] Similarly, the Republican candidate in the upcoming mayoral election, Samuel Kahn, agreed that the "injunctive proceedings … be forgotten for the time being," and asserted that a public meeting should be held to explain the reasoning behind the stations to the public.[96] Unfortunately, the meeting did not assuage residents' concerns, and the injunction halted construction on the Esso stations for several weeks.

The Palisades Interstate Park Commission's commitment to automobile usage and gasoline consumption beat out concerns over the proliferation of gas stations in Englewood Cliffs. Local residents' efforts only slowed construction, as a court order lifted the injunction on October 19 and Esso's two gas stations opened in 1960. The PIPC hoped the stations would sell gasoline to the nearly 8,000,000 drivers who traveled along Palisades Interstate Parkway annually. Connecting the southern portions of the park in Fort Lee, New Jersey and the park's northern terminus at Bear Mountain, New York, the parkway made it easier for people to both reach different sections of the park by car and explore its vistas along the way. The road became

popular quickly, and the estimated number of annual drivers increased by 37.5 percent between 1958 and 1959. [97]

The park's history demonstrates the complicated environmental and technological history of oil. At first, oil wealth helped to protect the Palisades from further development as the sites of profitable quarries in the late nineteenth century. Quarrymen, local businesses that dealt in crushed stone, and like-minded politicians faced off against a new group of people who fought to prevent industrial development of natural spaces. Here, conservationists, philanthropists, and sympathetic politicians worked to shut down the quarries and create a park at the Palisades. Donations from oil magnate John D. Rockefeller and his son John D. Rockefeller Jr. made this possible. John D. Rockefeller Jr. also used his considerable political influence to argue in favor of saving the Palisades, and extended the powers given to the park commission in the first decade of the twentieth century.

However, from the very beginning of the park's existence, the people in power envisioned a parkway within it. From state engineer Van Alstyne's early designs in 1904 to Rockefeller Jr.'s 1933 donation requiring the commitment to build a parkway, the development of the park always included plans for a large automobile road. Rockefeller Jr. emerged as the most influential philanthropist associated with the park, as his ideas about the necessity of roads in parks shaped his donations and the eventual construction of the parkway. Rockefeller Jr. believed automobile roads were necessary to park development because he recognized that the car could democratize experiences of natural landscapes. Even though creating roads were central in the park's history, other local wealthy landowners and citizens who wanted

to prevent unnecessary development challenged these construction plans. The parkway and its gas stations represented a spoiling of nature's beauty that they saw as antithetical to the founding ideas of the park. Even so, they were unable to prevent the park from being shaped by petroleum.

Private and public interests merged to reshape a significant feature of the regional landscape, the Palisades, into a piece of the nation's highway infrastructure. Infrastructure projects encouraged not just the consumption of oil, but also the penetration of oil into Americans' everyday lives. The processes of park development epitomize a popular understanding of the early to mid twentieth century—exemplified by John D. Rockefeller Jr.—that oil, gasoline, and the automobile enhanced the experience of being in nature, and that some natural spaces, like the Palisades cliffs, could and should be reshaped for that goal. Oil money made protecting the Palisades possible, and the automobile roads built within the park helped to make the park popular. The parkway actualized the idea that the use of oil's most popular product—gasoline—was inextricable from experiencing nature.

CHAPTER 4

Science, Technology, and Public Relations at Exxon, 1920-1985

In the 1972 spring issue of the *Lamp*, Exxon's self-published magazine for shareholders, chairman of Exxon's board J. K. Jamieson opened his editorial by describing his approach to oil's environmental problems. Jamieson wrote, "A formidable problem confronts not only the oil industry today but society as a whole." This problem, Jamieson explained, was what "some have referred to as the energy dilemma," or what he described as "a delicately balanced equation—the energy-environment equation." His editorial supported the idea that it was possible to have a clean and safe environment while also providing society with petroleum products. Jamieson asserted that in order for Exxon to meet society's increasing demands for energy, it had to continue to develop and rely on petroleum. We can do this, he explained, by supporting a healthy and robust energy industry and by protecting the environment. Jamieson surmised, "The overall objective must be to provide an adequate supply of energy for present and long-term needs at a reasonable balance between cost, dependability, and protection of the environment."[1]

Jamieson continued to counter criticism, especially from environmentalists, and to create a positive image of the oil industry's environmental influence in later editorials. That often meant pontificating on the company's environmental record and assuring readers that Exxon would find the technical solutions to oil's environmental problems. In an editorial from the 1974 winter issue of the *Lamp*, Jamieson declared that Exxon's "commitment to environmental conservation is strong—as it has been

for many years," citing an increase in corporate spending on environmental research.[2] In 1974, Exxon's expenditures on environmental research grew to $575 million, which was significant compared to the $350 million spent the previous year. Jamieson also claimed that oil effluent in water was "never a large amount," clearly downplaying Exxon's, especially the Bayway refinery's, consistent history of discharging significant amounts of waste in the air and water. He steadily maintained that technical expertise—"experience and technology"—enabled Exxon to respond to and prevent environmental crises. [3]

As discussed in Chapter 2, Standard Oil of New Jersey (SONJ) (which changed its name to Exxon in 1972) approached environmental issues as technical problems in the 1920s—problems that could be resolved by the expertise of its engineers and scientists.[4] This chapter continues this narrative by investigating how Exxon supported the mantra of technological salvation. How did the company establish a reputation for scientific and technical expertise in the public sphere? And was Exxon's public rhetoric consistent with oil industry pollution?

Understanding Exxon's rhetoric of expertise is crucial in answering these questions. As Tim Mitchell has argued in the context of twentieth-century Egypt, a "politics of techno-science" characterized ideologies of nationalism and economic growth, relying on "the expertise of modern engineering, technology, and social science," to improve nature and fix other social and economic ills.[5] Mitchell's account of the role of expertise in Egypt holds true for the development of Exxon during the same period. Exxon created a sense of broad scientific expertise from its role in developing petrochemicals during the twentieth century, and then used that

expertise to make the corporation's voice relevant in a number of contemporaneous debates, including those over environmental issues in the United States during 1960s, 1970s, and 1980s. However, this rhetoric hid the fact that oil refining remained far from environmentally benevolent throughout the twentieth century.

Between the late 1960s and the end of the 1980s, Exxon tried to convince Americans that its engineers and scientists were hard at work solving the environmental problems associated with oil refining. Consistent with arguments made in the 1920s, representatives from Exxon argued that the industry, not outside regulators or non-industry scientists, were in the best position to diagnose and respond to the inefficiencies that created pollution.[6] This chapter argues that the development of petrochemicals at SONJ, and later Exxon, supported the company's claims to technical and scientific expertise—expertise that allowed SONJ to represent itself as an environmental expert. This ethos of expertise has shaped public debates over the environmental issues associated with oil's use for most of the twentieth century.

This chapter investigates this history by first uncovering how, by publicizing its innovative petrochemical processes, SONJ created a reputation as a technical expert. Technological improvements, including the creation of tetraethyl gasoline, developments in catalytic cracking, the production of wartime chemicals, and the expansion of petrochemicals in the postwar period all enabled Standard Oil of New Jersey to cultivate an image of expertise and authority on the evolving science of petroleum refineries. I then analyze how marketing materials, like advertisements and the company's magazine for shareholders the *Lamp*, used such innovations to

generate a reputation of scientific expertise around petrochemical developments through 1960. The chapter then discusses how the company responded to renewed calls for regulatory control on oil pollution in light of the environmental crises of the late 1960s through the 1970s. Here, the company's marketing materials demonstrate how Exxon argued that its scientific and technological expertise, based in petrochemical developments, helped to solve environmental issues. All the while, the company continued to have problems with accidental releases at its New Jersey refineries.

SONJ's claims to scientific and technological expertise are rooted in the company's dedication to hiring experts from early on in its history. Standard Oil scientists and engineers were technical experts in the processes of oil refining. The company's early interest in developing these technologies and its practice of hiring well-educated scientific experts influenced the creation of the petrochemical industry over the course of the twentieth century. The development of petrochemicals at Standard Oil increased the significance of laboratory science at the refineries and the role of expert knowledge. Around the turn of the twentieth century, chemistry and scientific knowledge began to reshape refining practices. William M. Burton became the first professionally-trained chemist to work in the oil industry. Burton had a graduate degree in chemistry from Johns Hopkins University and was hired by John D. Rockefeller in 1889. Burton later began one of the first chemical laboratories in the petroleum industry at Standard Oil's Whiting refinery in Indiana.[7] By then, Standard Oil had also set up a small laboratory at the Bayonne refinery, employing

chemists to expand scientific knowledge of petroleum and test product quality by subjecting different refinery products to heat tests.

Early technologies helped Standard Oil emerge as a technical leader in the industry. In 1912, the invention of the Burton/Humphries thermal cracker dramatically changed petroleum technologies and ushered in a new phase of technological development. Working in horizontal stills attached to cooling coils, oil was heated to about 400 degrees Celsius and put under 75 to 95 pounds of pressure per square inch. Now refiners could use both heat and pressure to break down crude oil and heavier fuel oils into kerosene and gasoline. Since 1890, the introduction of the internal combustion engine increased the demand for gasoline and diesel fuels, and the thermal cracker enabled refiners to more easily meet these demands. As oil was discovered in places like Texas and Mexico, refiners had to figure out how to adjust their processes to accommodate petroleum with different viscosities and chemical makeups. Cracking technologies aided refiners in adjusting to different types of crude.[8]

Though SONJ was able to make some new petrochemical products, including the first petrochemical isopropyl alcohol in the 1910s and 1920s, it was the increased production and demand for gasoline that helped shape it as a company with significant scientific and technological expertise.[9] In the nineteenth century, kerosene dominated the petroleum refining industry as the most desirable and profitable product, replacing whale oil as America's preferred illuminant.[10] In the 1880s, Standard Oil's Bayonne, Cleveland, and Philadelphia refineries manufactured over a quarter of the kerosene on the global market.[11] However, petroleum found new uses

in the twentieth century, as gasoline supplanted kerosene for use in internal combustion engines. Ford's affordable and mass-produced Model T made car ownership easier and more accessible for average Americans. With mass production of automobiles, car ownership and gasoline sales skyrocketed. In 1912, there were 944,000 registered motor vehicles nationwide. By 1918, that number grew by a factor of six, to over 6 million. By 1929, there were more than 26 million registered motor vehicles driving on America's roads.[12]

Making a better fuel by improving on gasoline formulas made SONJ an expert within the oil industry. General Motors (GM) partnered with DuPont and SONJ in order to create a better form of gasoline. Unlike alcohols from corn or wheat, making a new fuel source with petroleum would allow manufacturers to collude with the oil industry in producing a product that could not be homemade. In December of 1921, GM scientist Thomas Midgley, Jr. and a group of chemists at GM's research laboratory figured out that a small amount of tetra-ethyl lead (TEL) eliminated engine knock and made gasoline more efficient.[13] The Ethyl Corporation, with ownership split between GM and SONJ, was created in 1924 to market the new compound. DuPont and SONJ began production immediately.

This moment—the early 1920s, when tetraethyl lead was introduced into gasoline—is crucial for understanding how SONJ developed its expertise as a petrochemical company. Because tetraethyl lead was a compound chemical made from mixing ethyl chloride with a lead/sodium alloy, Standard Oil had to increase production of ethyl chloride to continue manufacturing the gasoline-soluble compound. At first, when demand for the chemical was low, chemists were able to

make ethyl chloride from ethyl alcohol, as it was initially too costly to recover ethylene from gases produced from distillation. Working with scientists at the Ethyl Corporation, Standard Oil of New Jersey discovered how to get ethylene from "cracking" propane. The new technology, a gas cracker, became the basis for Jersey Standard's later steam cracker technologies, which made lighter aromatic hydrocarbons, like ethylene, easier to recover and employ in new products.[14] Cracking technologies, which broke heavier oils into fractions with lighter hydrocarbon molecules, increased the amount of gasoline that could be removed from a barrel of crude oil. Between 1914 and 1930, cracking technologies helped to increase the amount of gasoline produced from a barrel of oil from an average of 18.2 percent to 39.4 percent.[15] In the push to create new products for an expanding market, SONJ's expertise in, not only refining processes but also chemistry and chemical production, grew.

SONJ continued to hire experts in the field to work in its research labs. President Walter C. Teagle encouraged the development of scientific expertise in chemistry at the company during his tenure. He hired prominent chemists to work in the newly created Standard Oil Development Company, including professors from the Massachusetts Institute of Technology and Johns Hopkins University. One of his hires, Robert A. Milikan, won the Nobel Prize for Physics in 1923. SONJ chemists worked on problems related to engine-knock and octane ratings, improving refining techniques, and creating a synthetic rubber. The company also developed a partnership with the German chemical giant IG Farben, whose technical expertise helped SONJ become one of the leading chemical research facilities in the United

States by the end of the decade. As SONJ historian Bennett Wall puts it, "In one giant step, Jersey jumped from very limited applied research into the most advanced pure research in the world."[16]

Throughout the first half of the twentieth century, SONJ used the creation of TEL in their research laboratories in marketing materials to create a reputation as a scientific and technological authority. Figure 14 depicts an Ethyl Gasoline Corporation advertisement from 1939. In the center of the image, a truck delivers gas to a fueling station as a car, presumably already running on Ethyl gas, speeds past. Yet the central scene is secondary to the main theme of the advertisement. In the upper left of the image, a large white hand slowly pours drops of tetra ethyl lead from a test tube onto the gas station scene. Here, the hand and the test tube represent the research facilities and scientists at Ethyl and SONJ. The research laboratory's role is paramount in creating TEL gasoline and suggests the compound's scientific superiority in comparison to other gasoline. Text below describes TEL as "almost as important as gasoline itself," and asserts that TEL "is opening the road to the even more efficient engines of tomorrow." The ad depicts TEL as not only a harmless substance, but also one whose value was both equal to gasoline and ubiquitous, found in "70% of all motor fuel." Everything in the image is clean, perhaps intended to reflect the sterility and cleanliness inside a research laboratory. For SONJ, the research laboratory not only held practical applications, but also became an important piece of the company's marketing strategies.

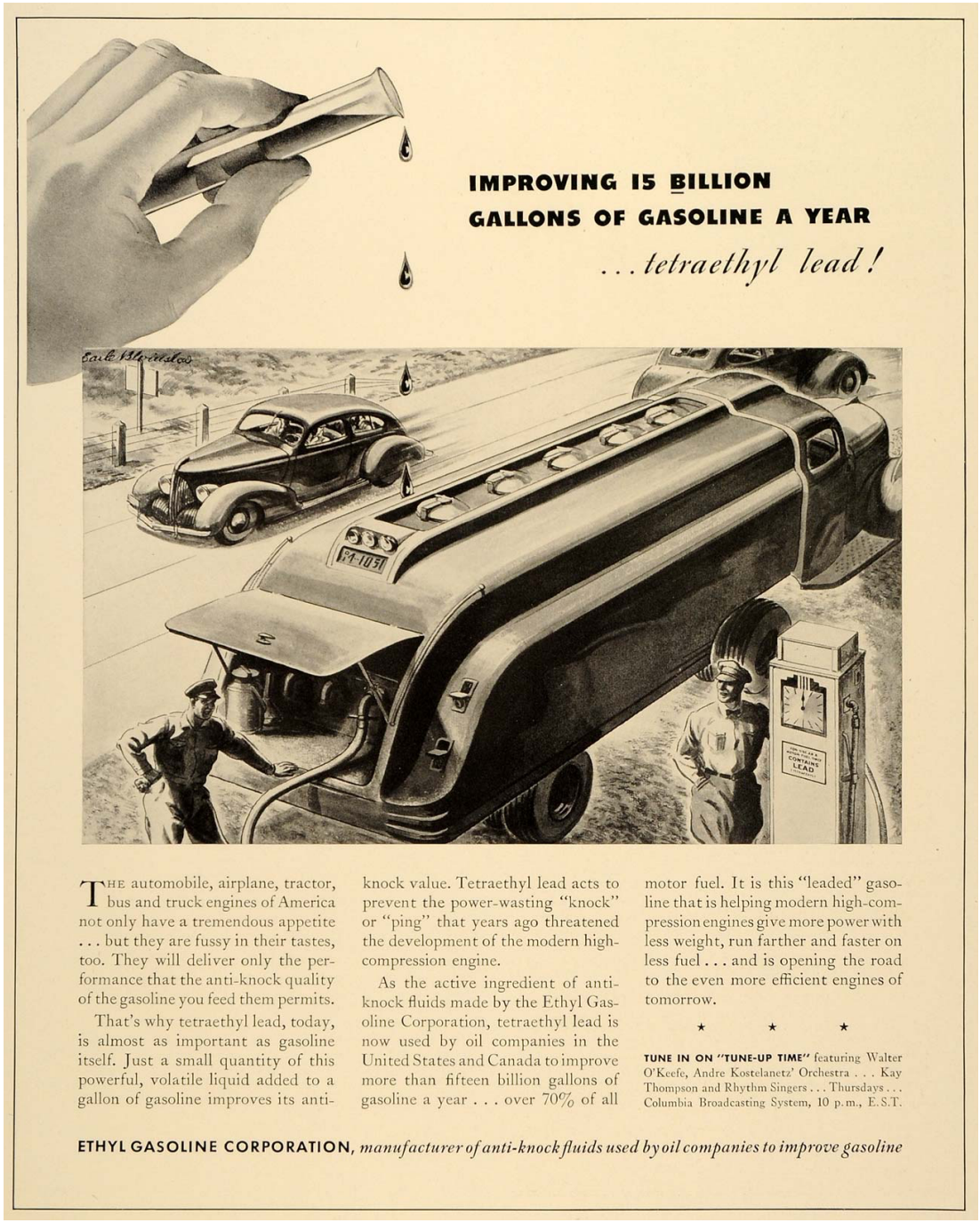

Figure 14 - This 1939 advertisement from the Ethyl Gasoline Corporation used the image of laboratory science as a selling point for Ethyl gasoline. "Improving 15 Billion Gallons of Gasoline a Year… *Tetraethyl Lead!"* http://www.ebay.com/itm/1939-ad-ethyl-gasoline-tetraethyl-lead-walter-o-039-keefe-original-advertising-/370978838597

SONJ also used the *Lamp*, a glossy corporate publication sent quarterly to shareholders and interested members of the public, to publicize its scientific and technological expertise. In the magazine, SONJ worked to counter negative images of oil spills and pollution by including information about the technological solutions its engineers were developing in refineries like those at Bayonne and Bayway. The *Lamp* was a forum for the company to express ideas about its technical ability to solve these problems and elaborate on new technical processes. Alongside discussions of technology, articles in the *Lamp* communicated the company's public perspective on nature and the role of the environment within oil refining. Their mantra, that technology could solve environmental problems, remained a key part of the company's message through the 1980s, and continues to influence public and private debates on this topic.

Developing petrochemical expertise at SONJ also meant reducing wastes. In the 1920s, writers at the *Lamp* saw the power of petrochemical research to reduce refinery wastes. In an article from the April 1925 issue, T. Goodwin, a petroleum chemist, explained, "In the refining operations there are often produced products which have been discarded as valueless, or for which there was no immediate need." Often these products were released into the atmosphere; that is, of course, until the research chemist came along. Goodwin continued, "It has been the purpose of the research chemist to eliminate the production of waste materials or to convert the so-called waste material into useful products."[17] Though Goodwin did not explicitly connect this idea to protecting the environment, the article demonstrates how researchers at SONJ, even at this early stage, envisioned petrochemical research as a

way to reduce the amount of hydrocarbons released into the environment during the refining process. Though SONJ did not focus too much on this connection in the 1920s, it would so unequivocally later in the 1970s and 1980s.

Goodwin's article highlights researchers' and administrators' optimism about petrochemical innovations in the 1920s. This optimism is significant because it reflects the company's growing expertise in the nascent field. Goodwin described how refiners at SONJ were using refinery gases (which used to be released into the atmosphere) in new types of products, like isopropyl alcohol and other types of alcohols. But Goodwin's positivity went further than describing past innovations; he also proposed new ways that petrochemicals could be used. He theorized that petroleum oils might one day replace animal or plant fats in foods, writing, "The direct oxidation of a hydrocarbon mixture such as paraffin wax or a petroleum distillate, by means of air, gives promising results and is a potential means of producing synthetic fats as a source of human energy."[18] Goodwin's ideas were not outside the norm; public understanding about the chemical nature of foods was spreading in the late 1920s and 1930s.[19] In his article, Godwin epitomized how writers at the *Lamp* envisioned SONJ's technological and scientific expertise as both innovative and socially useful.

During the late 1930s and 1940s, catalytic cracking revolutionized the oil industry, and SONJ used its role in developing these technologies to promote the significance of its expertise. Figure 15 shows one of SONJ's first fluid catalytic crackers at the Baton Rouge refinery. The image was printed on a full page in the company's magazine. The headline, "Will your kids find its picture in the history

books?" and a short description below aligned the development of catalytic cracking with other transformative inventions, like the cotton gin or the steamboat.[20] The contrast between the image and the provocative heading suggests both the influence SONJ thought its technology had on American life, and the role its experts played in shaping how society adopted the use of petroleum. From the company's perspective, developments in refinery technology, especially the invention of catalytic cracking, were important historical moments. Catalytic cracking technology was revolutionary and belonged in the cannon of technological innovations that represented American progress.

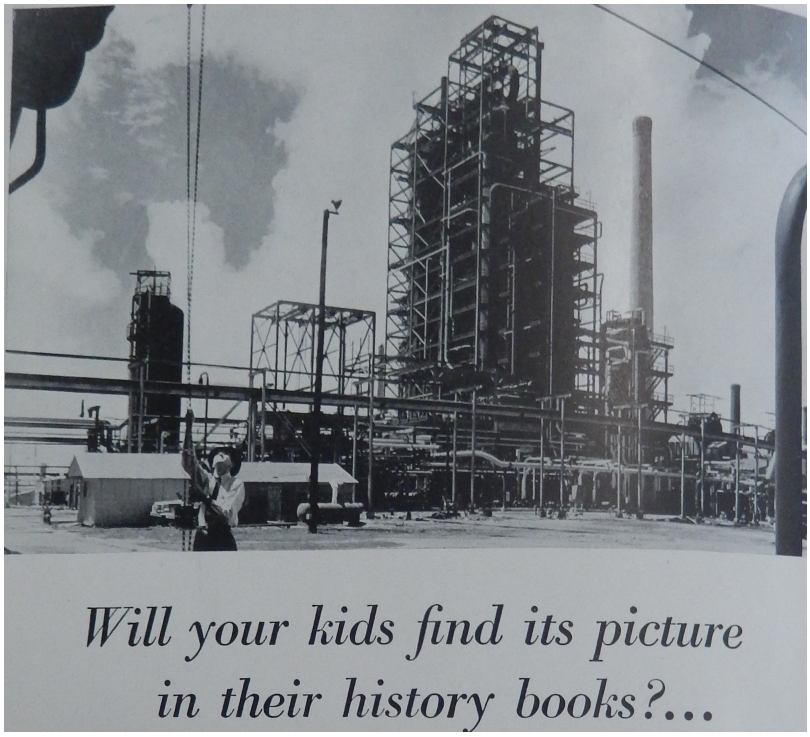

Figure 15 – This image and heading appeared in the *Lamp*, a magazine published by Standard Oil. Pictured is the second of Standard Oil's catalytic crackers, installed at the Baton Rouge refinery in Louisiana. The full-page advertisement reflected the company's belief in the power of refinery technologies and hinted at the larger cultural significance of technological inventions—as creating modernity. "Will your kids find its picture in their history books?" *Lamp* 25, 4 (December 1942): back cover, Box 2.207/D163, Exxon Mobil Historical Collection, Dolph Briscoe Center for American History, University of Texas at Austin.

In creating massive amounts of the chemicals need for war, SONJ found new fodder for its public relations campaign. World War II strengthened SONJ's confidence in its technological and scientific expertise. As the company mobilized its workforce and researchers to create not only the materials needed for the war effort, but also better materials than had been available before, SONJ cultivated its role as oil industry expert.[21] For example, meeting the military's needs for toluene required a reorganization of SONJ facilities and operations. The top right corner of Figure 16 shows how SONJ orchestrated the use of several different facilities to create the correct grade of pure toluene. Crude oil, extracted from deep in the Texas ground, was shipped to the Bayway refinery on an ocean tanker. There it was distilled and hydroformed into a crude version of toluene at a facility specially converted to house the process. Then it was rushed by rail the 1,800 miles back to the Humble Oil Refinery at Baytown, an SONJ subsidiary, where the crude toluene was extracted using a solvent to get up to 90-percent pure toluene. Then it was sent to SONJ's Baton Rouge refinery, where it went through a final round of cleansing to bring it up to 99.7-percent purity. All of the equipment had to be meticulously cleaned and maintained to create the purification necessary for high-quality toluene. In the process, what began as 105 railcars full of naphtha became only two of pure toluene.[22]

Figure 16 also demonstrates how expertise played a key role in creating the petrochemical materials for war. The image is an excerpt from a celebratory comic book created by SONJ to describe the efforts of its researchers in creating toluene for the war. The comic book tells how an all-white male cast of scientists, engineers,

railway workers, and administrators worked together to solve the problem of producing additional high-grade toluene. In the first pane on the top left, a man (likely our scientific expert researcher) exclaims to an older man (likely his supervisor), "But, Chief I always put the stuff in there an'it comes out here!" to which the response from "Chief" is: "Never mind! This time it goes 'round and 'round and comes out there!" Here, the comic conveys the difficulty of explaining the complexity of the technological processes that create toluene. The white labs coats they wear express the researcher's expertise in petrochemical processes, even if their language doesn't. A byline to that pane adds, "In the successful purification of toluene a radically new technique was applied, since the purpose was strictly secret, even the laboratory technicians couldn't understand what was going on." SONJ prided itself on the innovation behind this new toluene production process. One pane also jokingly reduces an interaction between lab technicians in the refinery from technical instruction to over simplified commands. All together, the comic tells a familiar story of white male American ingenuity persevering in the face of a relentless and technologically-advanced enemy. Here, SONJ inserts itself into the dramatic narrative of the war as a competent ally, able to produce the most important chemical materials of the war. From SONJ's perspective, its innovation helped win the war.

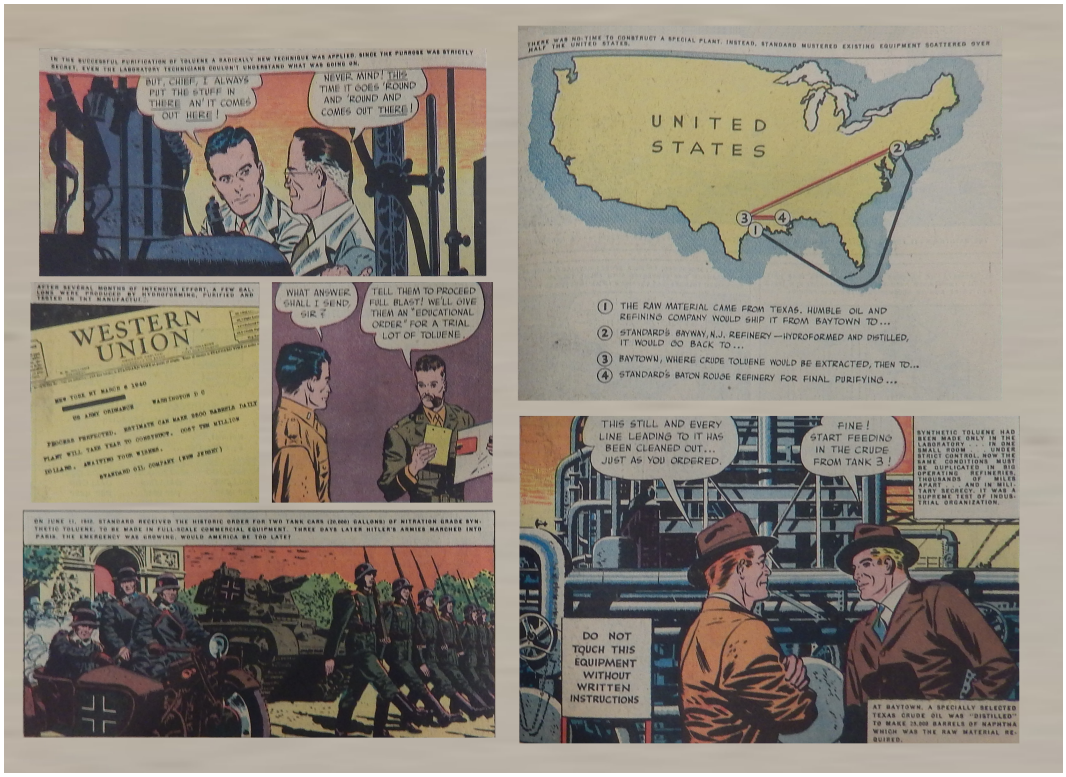

Figure 16 - The above images shows two pages from a short comic book Standard Oil of New Jersey created to document the development of synthetic toluene. The comic book depicted a heroic coming together of business people, engineers, and military men in the effort to create the chemicals necessary to defeat America's enemies in World War II. Ray Bailey, "Blockbusters from Oil: The Exciting True Story of Synthetic Toluene Secretly Developed Source of the TNT that Blasts America's Foes," Standard Oil of New Jersey, 1944, Box 2.207/L12C, Exxon Mobil Historical Collection, Dolph Briscoe Center for American History, University of Texas at Austin.

By the 1960s, ideas about technological and scientific mastery were entwined in much of SONJ's public messaging. In his introductory editorial to the fall 1960 issue of the *Lamp*, president M. J. Rathbone celebrated what he called the "promise of petrochemicals." He reviewed how Standard Oil had been a leader in this new industry, helping to reshape the world through petrochemicals. These new chemicals, the product of scientific inquiry into the raw crude nature had made, were changing the world. "The entire petrochemical industry," Rathbone summarizes, "sprang up from the success of scientists in unlocking the vast potential stored inside the molecules of petroleum." Science enabled researchers to make better use of nature's gift of petroleum and in doing so, enabled petroleum to become a more powerful and

integral part of American life. Standard Oil's scientists and researchers "improved on nature by breaking up and rearranging these hydrocarbon molecules," Rathbone exclaimed.[23] By 1960, the corporation's commitment to scientific inquiry into petroleum and petroleum technologies was integral to both its self-image and its vision for the future.

In its public relations messaging from the early 1960s, SONJ exuded a sense of technocratic optimism, almost arrogance, about its relationships to nature. Inherent was the corporation's assuredness that it had the ability to control nature. A 1962 advertisement placed by one of SONJ's subsidiaries, is perhaps most emblematic of the company's public perspective on the relationship between nature and technology during the mid-twentieth century. Here, Standard Oil hoped to portray itself as a positive influence on nature—a perspective wrought with contradictions. As shown in Figure 17, the advertisement features a large two-page spread of a glacier. However, the benign image of the glacier's crags is reshaped through the advertisement's text. The title proclaims the awesome power of oil refineries' products, while the descriptive text has more ominous overtones about the implications of that potential heat energy: "This giant glacier has remained unmelted for centuries. Yet, the petroleum energy Humble supplies—if converted into heat—could melt it at the rate of 80 tons each second!" Far from destroying nature, the ad asserts, "Humble has applied science to nature's resources to become America's Leading Energy Company."[24] The advertisement suggests that the corporation saw itself as a master of nature through its technological and scientific expertise.

Figure 17 – Technological progress at Humble Refining was expressed through the metaphor of melting glaciers, ironically foreshadowing the significance of the combustion of fossil fuels in global warming. "Each Day Humble Supplies Enough Energy to Melt 7 Tons of Glacier!," *Life Magazine,* February 2, 1962, https://books.google.com/books?id=k00EAAAAMBAJ&pg=PA86-IA2#v=onepage&q&f=false.

Expressing its expertise in relation to nature became much more important to SONJ after the environmental crises of the late 1960s. SONJ even shifted its strategies to argue that its mastery of science and technology made it not only a petrochemical expert, but also an expert in environmental issues, especially those related to pollution problems. SONJ hoped to reassure the public and its shareholders that the company was doing everything it could to prevent pollution during refinery processes and in disaster situations. Then, during the 1970s, Exxon maintained the idea that environmental pollution was an engineering problem, attempting to focus public attention on improving waste-management methods and safety systems. These arguments often harkened back to expertise learned from petrochemical development. However, an increasingly informed public was much less willing to accept the

company's explanation, especially in the face of continued environmental degradation at local refineries. Oil companies, Exxon included, fell under intense scrutiny for the industry's environmental impact in the 1960s, 1970s, and 1980s.

In the late 1960s, the environmental catastrophes and an emerging public concern for environmental health challenged SONJ's earlier optimism about its own expertise and mastery over nature. On March 18, 1967, the oil tanker *Torrey Canyon* ran aground along the southwest coast of Britain, spilling oil into Cornwall's marine ecosystem.[25] The *Torrey Canyon* spill attracted significant international attention. Then, in early 1969, a blowout at an oil platform sent 235,000 gallons of oil into the coastal waters of Southern California, killing large numbers of marine animals and washing oil onto Santa Barbara beaches. Residents nearby responded immediately. Local Santa Barbarans formed a group called GOO, or Get the Oil Out, and submitted a petition with 110,000 signatures to President Nixon insisting that the federal government begin "taking immediate action to have present offshore oil operations cease and desist at once."[26] GOO's quick and organized response reflected how the wealthy Californians who lived along the city's beaches were no longer immune to the industrial pollution that affected less affluent communities across the country, highlighting the need to consider petroleum pollution as a public policy issue.[27] The *New York Times* reported in April of that year that the public response to Santa Barbara and *Torrey Canyon* helped to strengthen environmental bills under consideration in Congress, whose drafts from a year earlier were much kinder to the oil industry.[28] While ultimately neither event brought swift change to industry practices, they reignited the idea that the oil industry contributed to environmental

pollution. As one *New York Times* article put it, there's "no political calm for oil companies."[29]

Public health concerns about petroleum resurfaced in the late 1960s as well.[30] Airborne lead was once again seen as a significant threat to public health officials. In 1965, debates over the use of lead in gasoline reemerged as a source of controversy after it was revealed that American's gasoline had one hundred times higher than average blood lead concentrations. Consequently, public health researchers and scholars focused their attentions on the environmental causes of chronic disease. In the late 1960s and early 1970s, gasoline manufacturers faced criticism for their use of lead.[31]

SONJ faced new environmental regulations, as well. The flaws of the Oil Pollution Act of 1924—and other environmental laws like the Water Quality Act of 1965 and Air Quality Act of 1967, which did not identify standards on industrial waste practices—became fodder for public debate concerning the health of the environment. [32] By the late 1960s, oil pollution from tankers and land-based refineries had, according to one *New York Times* article, "stirred international protest."[33] Domestically, a few politicians supported legislation to correct inadequacies of the 1924 bill. At the time, the law asserted that in order to be liable to any damages, tankers must be "grossly negligent" in events surrounding any oil pollution. Such phrasing clearly left plenty of room for debate over oil companies' intentions. These new bills hoped to make oil companies liable for accidental spills.[34]

Some of the criticism against oil companies came from government-funded projects. The Environmental Protection Agency's (EPA) Documerica project

illustrated the environmental problems of oil refining to those who didn't experience it firsthand. In the 1970s, the EPA created Documerica, inviting freelance photographers to take photos documenting the nation's environmental issues. Inspired by the images created by photographers working for the Farm Security Administration during the Great Depression, the EPA hoped the project would bring light to environmental concerns. By 1978, the project had generated approximately 20,000 photos from across the country.[35] Though the *New York Times* offered a critique of the series in 1972, suggesting that overall, "the message does not connect pollution to consumption," the images demonstrate how environmental issues had infiltrated many of America's landscapes.[36]

Figure 18 offers potent symbolism for the threats that oil pollution posed to America. It is an image from the Documerica project depicting oil in the water surrounding Liberty Island, just north of Bayonne, New Jersey. Here, an oil slick wraps around the northeastern side of Liberty Island and spreads north into New York Harbor. Higgins's careful framing of the shot—focusing most of the image on the oil slick and leaving Lady Liberty only in the top left quarter of the image—tells the viewer what is most important about this waterscape. The oil spill takes over the potentially-patriotic shot, consuming Lady Liberty almost entirely. The photo's sepia-tone coloring also historicizes the contemporary image for viewers, suggesting that this would be how people remembered the waters surrounding the Statue of Liberty if petroleum pollution persisted. By highlighting oil pollution instead of the Statue of Liberty, Higgins implies that oil pollution rivals Lady Liberty as a symbol of America.

Figure 18 – Charles Higgins, "Oil Slick Surrounds the Statue of Liberty in New York Harbor," *Documerica*, circa 1972-1977, accessed June 28, 2017, https://catalog.archives.gov/id/553862. The image suggests that oil pollution has invaded the most symbolically American landscapes.

SONJ voiced its response to public criticism by enlisting the scientific and technological expertise it had developed earlier in the century. It attempted to use this expertise to shape itself as an environmental steward. In these articles, SONJ began responding to environmental problems with the idea that technological solutions existed (or would exist in the near future) to relieve Americans of the burdens of oil pollution. In "The Quest for Cleaner Air," an article published in the *Lamp* the winter of 1965, the author hoped to calm readers by suggesting that environmental debate had become too emotionally charged and often ignored technological solutions to pollution. "One important point, often overlooked in sensational reports on the subject," the author wrote, "is that air pollution can be controlled. With techniques

already developed or on the way, the battle for clean air could be won."[37] Environmental problems had technical solutions, he asserted. The recent criticism of the oil industry was emotional, and reason was on the industry's side. The article then described how pollution was not a new problem and afflicted all human societies; however, Americans were poised to present the most efficient response to it yet. The author recognized how some laws already passed in places like Los Angeles had helped to lower air pollution, but regulations needed to be based on scientific evidence and technical skill.

Oil companies positioned themselves as an expert source of knowledge about environmental issues. "The Quest for Cleaner Air" described how the oil industry, the American Petroleum Institute, and the SONJ all worked diligently on environmental conservation projects within their organizations. The author asserted, "Major oil companies such as Jersey Standard and its affiliates conduct their own extensive research programs and develop manufacturing techniques, new equipment, and improved products to reduce air contamination."[38] As a result, oil industry expertise was paramount to the reduction of oil pollution. The author continued, "Because these companies have built their business on the production, processing, and marketing of hydrocarbon fuels, they are deeply involved in winning the war on pollution."[39] As it did earlier in the century, the oil industry posed as the expert applying its technologies to environmental problems.

Here, this sense of expertise was tied directly to the oil industry's role in the development of the petrochemical industry. The existence of the petrochemical industry was the best proof that the oil industry cared about reducing its wastes. The

author of "The Quest for Cleaner Air" elaborated, "Modern refining techniques save thousands of barrels a day of raw materials that once went up the chimney in smoke of fumes or were lost by evaporation in storage tanks."[40] In the first decades of the twentieth century, gaseous hydrocarbons were often simply released into a refinery's smokestack as waste products, as discussed in Chapter 2. But the invention of petrochemicals and the petrochemical industry had turned that waste into wealth. Such a transformation, the text argued, foiled charges that the oil industry was unconcerned with effluents.

SONJ presented readers of the *Lamp* with plenty of examples of their technology at work saving the environment. Several articles from the 1970s described for readers the vast technical systems that refiners developed to protect the environment. In "How Exxon Saves Energy" (1975), author Richard Rutter explored the many new processes and practices Exxon had developed to cut down on the oil used to power refineries. In doing so, he defined conservation via industry technology and engineering expertise, assuring readers that the company was searching for and developing practices to reduce refinery waste. He asserted, "Exxon has long practiced energy conservation through the design of new and improved petroleum processes and equipment and helping affiliates to achieve greater fuel savings in the operation of existing equipment."[41] Focusing on energy conservation within the refinery could have beneficial effects on the environment, Rutter suggested, as a barrel of oil saved is just as good as one fresh out of the ground, thus reducing oil released into the environment during refining processes. He then described the techniques that Exxon engineers employed between 1973 and 1975 to reduce energy use at its refineries by

15 percent, such as cleaning heat exchangers, repairing steam traps and fittings, developing heat-recovering equipment for stack furnaces, and reducing excess air in refinery furnaces. In 1972, Bayway was one of three US refineries that reduced the amount of refinery fuel it consumed for energy by 17 percent. Exxon also established requirements outside of the refinery to limit and reduce electricity use, setting travel-mileage limits for salesman, replacing light bulbs at gas stations, and decreasing lighting, heating, and air conditioning in office buildings. These methods built on those the company had incorporated during the 1930s and 1940s, when Progressive-era ideals of efficiency were first integrated into SONJ's refinery operations. To the company, increasing efficiency and creating technological solutions to limit waste and conserve fuel represented important and positive environmental goals.[42]

In addition to the *Lamp*, SONJ used other media to express its mastery of environmental issues. In 1970, the public affairs department published a booklet titled *The Civilizing Molecules* that elaborated on the company's ideological stance on the relationship between science, technology, petroleum, nature, and society. The booklet contained a short description on the title page, identifying its contents as "the contributions of petroleum and chemical science and technology to a world of greater abundance, and to the preservation and improvement of man's environment."[43] The booklet was meant to suggest that SONJ's main goals were not just in extracting petroleum, producing gasoline, or even oil refining research, but that the company was devoted to "the constant quest of Jersey scientists for new uses for oil and improved petroleum products," and developing "productive interdependence of science and industry in the world today."[44] In the introductory text of this booklet,

SONJ made claims to expertise in oil refining technologies as well as the larger goals of industrial scientific research.

In addition, *The Civilizing Molecules* describes the connection between petrochemical research and environmental conservation at SONJ. While committed to further expanding the usefulness of petrochemicals, the text suggests that the industry and SONJ also hoped to apply their research to conservation. For example, the text explains the methods by which SONJ scientists investigated how hydrocarbons were formed, the chemical processes of combustion, and how enzymes could influence chemical reactions. The booklet claimed that with discoveries on such topics, "tomorrow's world may be transformed through significant advances in such areas as environmental control, energy conservation materials, and food production."[45] For example, Esso Research and Engineering worked on major projects "to find solutions for the contamination of air which can result from the burning of fossil fuels in power plants, large apartments houses, and in automobiles, particularly in congested areas." By reducing the sulfur content of some of its heavy fuel oils used to heat boilers in buildings and run machinery in factories across the world, they could reduce the amount of particulate matter in the atmosphere. The booklet argued that oil company research was a crucial piece of pollution control.

Behind the rhetoric of technological expertise and environmental protection, Exxon was still a major polluter in the New York metropolitan region. Given their proximity to the Bayonne and Bayway refineries, local people in New Jersey's industrial corridor along the Arthur Kill and Kill Van Kull were forced to deal with petroleum pollution problems in their daily lives. Their lived experiences of oil

pollution contradicted Exxon's public messaging of technological control over environmental issues. Oil spills and refinery accidents were a regular occurrence in the region's oil industry, and most have not received public or official attention. The Bayway refinery committed serious environmental infractions during the 1960s. In 1967, Standard Oil's Refinery Losses Committee—an internal corporate-wide committee organized in the 1930s to combat waste in refinery operations—recognized Bayway as having the worst pollution statistics of any of its refineries. An internal report claimed, "Bayway substantially exceeds all target pollution controls."[46] This refinery was worse than most of the company's other facilities at limiting effluents. Bayway failed to meet New Jersey's air pollution standards on smoke and particulate matter. The refinery also received criticism from New York authorities, since its gases flew over to Staten Island. It got so bad that in 1967, the state of New Jersey flat-out forbade the refinery from contributing any more pollution to the nearby Arthur Kill.[47] In addition, the decade between 1982 and 1991 averaged 111 small and uncontained spills per year. 1989 was particularly egregious. That year, the Natural Resources Defense Council recorded 275 small spills in the region.[48] To local residents, the consequences of living and working near the oil refineries were clear.

Moreover, the construction of the New Jersey Turnpike allowed regional drivers to see and smell the refineries firsthand.[49] Located just east of the Turnpike at mile 99, drivers were confronted with the visual and olfactory consequences of having oil refineries in their midst. Sulfur byproducts from Exxon's Bayway refinery, along with those from the other refineries set up along the Arthur Kill, produced an

ever-present smell of rotten eggs. Many variations of crude oil contain putrid sulfur, and the smell of the desulfurization processes has long been a characteristic of refineries and a nuisance to those nearby. As one newspaper article from 1984 complained, "The smell is still one of a huge bowl of egg salad left in the sun to rot."[50]

Releasing gas was commonplace. In the mid-1980s, Exxon was fined multiple times for the release of foul-smelling hydrogen sulfide gases that wafted across the metropolitan area. In one instance, the company was fined $45,000 for accidental emissions of sulfurous gases.[51] Air pollution was a regular part of life for those living nearby. It was so dependable that in the late 1980s, the Elizabeth high school baseball team would note the direction of the wind, and in which direction to try to hit the ball, by whether the air smelt like rotten eggs.[52] Though Exxon worked hard to counter public narratives of oil pollution, for people living near the refineries, oil pollution was a fact of daily life.

Since the late 1960s, the company has argued that environmental problems have engineering solutions. This messaging relies on scientific expertise built during the forty years between 1920 and 1960. During that time, it developed technological and scientific expertise in oil refining and in the creation of the petrochemical industry. Its scientists and engineers found new uses for petroleum fractions, like the gaseous molecules used to make plastics, and reshaped the chemical industry and American consumer society. Acknowledging the scientific and engineering expertise stemming from expansions in its petrochemical divisions encouraged SONJ to look beyond the refinery for applications of its technology. The

company incorporated this sense of expertise into its public relations messaging throughout the 1930s, 1940s, and 1950s. By the 1960s, the company actively asserted that through its oil refining technologies it could control and shape nature into more useful commodities, like energy and petrochemicals.

In response to the environmental crises of the 1960s and 1970s, SONJ argued that engineering would correct pollution problems. This mantra remained a key part of the company's message through the 1980s. In this new era, SONJ was going to use its expertise in science and technology to forge a new image—not one of being able to control nature, but one of being able to clean it up. SONJ depicted itself as an expert in the conversation on environmental conservation in pubic affairs materials. The company's long history of attempting to minimize pollution, its efforts in helping transform previously worthless fractions of petroleum into valuable petrochemicals, and its wish to present oil refining as beneficial to nature informed this shift in message. Public affairs documents like "The Civilizing Molecules," editorials from its Chairmen of the Board, and articles in the *Lamp* all attempted to hide the environmental costs of oil's use and instead demonstrate the company's skill and expertise in managing such issues. Opposite this informed perspective was the consumer, whose inability to use products effectively created, they argued, most of the environmental problems.

Over the course of the twentieth century, SONJ worked to convince the public that its engineers were working on solutions to environmental problems. This messaging can serve as an explanation for the public's collective apathy towards the environmental problems associated with oil. If SONJ was the expert in oil pollution,

then it simultaneously relieved the public and politicians from the burden of solving complex environmental problems. The public could rest assured that the oil company was looking out for society and nature. Imagining a technological future where oil's wastes were at a minimum and the benefits of using oil had increased the country's affluence allowed SONJ to deflect criticism and contribute to public and political conversations about conservation as the expert voices. Evidence countering this narrative lies with the Bayway and Bayonne refineries, as they continually failed to meet pollution regulations in the 1970s and 1980s. They were a thorn in the side of SONJ's self-created environmental persona. Local New Jerseyans' lived experiences of pollution stand in stark contrast to Exxon's public relations messaging. Environmental pollution has remained an unavoidable piece of oil's legacy.

CHAPTER 5

What Exxon Knew About Climate Change, 1977-2000

In July of 1977, Exxon scientist James Black gave a presentation on "The Greenhouse Effect" to the Exxon Corporate Management Committee, a group of some of the most powerful executives at the corporation. The greenhouse effect, Black clarified, "refers to a warming of the earth's atmosphere due to an increase in the concentration of carbon dioxide." Climate science was an emerging scientific discipline, and Black presented his information carefully to his powerful audience. Scientists had been monitoring atmospheric carbon dioxide, he explained, since the late 1950s. Although most of the energy that Earth receives from the sun is "reflected back into space" or "absorbed at the Earth's surface," Black informed his audience, "carbon dioxide and other atmospheric constituents absorb part of the infrared radiation." This, Black asserted, "warms the atmosphere."[1]

Black wasn't just giving a climate science lesson to Exxon's executives. Their time was not to be taken so lightly. As a former researcher from Exxon asserts, "The management committee only has a limited amount of time and they're going to deal with issues that are of relevance to the corporation as a whole. They're not interested in science, per se, they are interested in the implications."[2] In the late 1970s, this meeting signifies that Exxon regarded the greenhouse effect as an issue relevant to its business. Though it was important to understand the science behind the role of carbon dioxide in the atmosphere, more important was its implications on the corporation as a whole. Crucially, Black believed that the

greenhouse effect could have serious repercussions for Exxon and he fortified his claims with the expertise of others, asserting his research was based on "recent literature" from "some of the leading research people in the field." He explained how climate scientists had discovered that carbon dioxide levels were increasing "uniformly" across Earth's atmosphere. Here was the big problem, Black told Exxon executives: "Atmospheric scientists generally attribute this growth in CO_2 to the combustion of fossil fuel."[3]

Even though this was 1977, climate science was a nascent field, and Black admitted that there were significant uncertainties involved in trying to predict the effects of increases in carbon dioxide, his message had a sense of urgency. He highlighted the need to move quickly to reevaluate Exxon's business practices to prevent irreversible changes to the climate. "Present thinking holds that man has a time window of five to ten years," Black asserted, "before the need for hard decisions regarding changes in energy strategies might become critical."[4] Black urged Exxon's executives to act quickly to combat what he, and other scientists, believed were grave threats to humanity.

However, Black's presentation stands in opposition to what historians and the public have generally believed about Exxon's stance on climate change. Since the late 1980s, the company has been a leading benefactor to organizations producing climate-change-denial rhetoric and often was a vocal participant in that dialogue. Exxon, through the leadership of CEO Lee Raymond, cast doubt on the legitimacy of climate scientists' claims throughout the 1980s, 1990s, and 2000s.[5] Exxon used its reputation for scientific expertise to highlight critiques of climate science instead of

supporting it. Nevertheless, Black's presentation, and other documents recently discovered, demonstrate that Exxon knew that the combustion of fossil fuels created climate change, even in the context of the historical uncertainty regarding climate science in the 1970s and 1980s, and well before the oil giant took a stand as a climate change denier in the late 1980s and 1990s.[6]

The discontinuity between Exxon's public rhetoric of doubt and its climate science programs raises historical questions. What exactly did Exxon know about climate change? Were there discrepancies between what it knew and what it told the public? How does new knowledge about Exxon's corporate research change how we understand the company's relationship with the environment and its reputation for scientific and technological expertise?

This chapter places Exxon's knowledge about climate change in historical context and analyzes the connections between Exxon's climate research and the larger history of the company's environmental and technological expertise. This chapter argues that Exxon used its expertise to both study climate change and to deny its existence. Climate science programs at the company were innovative in the late 1970s and early 1980s. However, once Exxon administrators decided to highlight doubt rather than exploration in climate science, the company used their reputation for scientific and technological expertise as fodder for arguments denying the validity of climate change.

This chapter first investigates the creation of Exxon's climate science programs, showing that this new research not only built on the company's existing expertise, but also built expertise in climate science itself. It explores the potential for

Exxon to become an active and vocal voice in the international dialogue on climate change and the possible public relations programs that could have enabled Exxon to take global leadership on this issue while climate research was still in its infancy. It then examines changes to Exxon's climate science programs in the mid-1980s that decreased program funding and changed the tenor of the company's climate research. It then explores how in the late 1980s and 1990s, Exxon used its expertise to argue against the legitimacy of non-Exxon climate scientists' concerns about the potential risks of climate change.

Climate science emerged at Exxon in the mid-1970s. Under the direction of Exxon manager Henry Shaw, an elite group of scientists—including James F. Black, whose 1977 presentation is the earliest record available of Exxon's knowledge of climate change—began studying the greenhouse effect at the company's main research facility, Esso Research and Engineering (ER&E) in Linden, New Jersey. The group originally sought out new projects "of national significance" and was drawn to climate issues. For Shaw, there was a sense of urgency in developing Exxon's climate science programs. "Exxon must develop a credible scientific team," Shaw urged Edward E. David, then-president of ER&E, "that can critically evaluate the information generated on the subject and be able to carry bad news, if any, to the corporation."[7] In addition, when he started working at Exxon, James Black was given permission to investigate scientific problems that interested him, and was motivated to research Earth's climate because he dreamed of modifying weather patterns to benefit agriculture in arid regions. Black became a technical expert at Exxon, earning

dozens of patents during his career there, and continued researching his interests in the science of the global climate.[8]

From the beginning, Exxon hired academics and expert researchers to undertake climate science at ER&E. Researcher Martin Hoffert left his position at New York University to work on climate modeling at Exxon in the 1980s. He claims, "We were all interested as geek scientists at the time. There were no divisions, no agendas." The potential policy problems that had started to worry the higher-ups did not seem to be a problem for Exxon's researchers on the ground. Hoffert spoke of his colleagues Brian Flannery, a former associate professor of astronomy at Harvard, and Andrew Callegari, a former mathematics professor at New York University, as "very legitimate research guys."[9] In addition, climate science programs at Exxon involved partnering with other scientific organizations, including the federal government and universities like Columbia.[10] As part of Henry Shaw's team of climate science experts at ER&E, Hoffert, Flannery, and Callegari used their expertise to build a compelling and innovative research program at Exxon.

At least one administrator had a grand vision for the elite scientists Exxon brought in to study the greenhouse gas effect. Harold N. Weinberg ran ER&E's Technology Feasibility Center in the 1970s, and his department was responsible for determining commercial uses for ER&E science.[11] Weinberg wrote in a memo from 1978, "I propose that Exxon be the initiator of worldwide 'CO_2 in the Atmosphere' R&D program…" Weinberg's vision here is ahead of its time. No other such program at a corporation on Exxon's scale existed, and Weinberg's reasoning suggested that such a program could benefit humanity. He continued, "What would be more

appropriate than for the world's leading energy company and leading oil company [to] take the lead in trying to define whether a long-term CO_2 problem really exists, and if so, what counter measures would be appropriate?"[12] Early on in the company's forays into climate science, when there were still so many unknowns about what its impact would be, Harold Weinberg saw the potential for Exxon to emerge as a leader in global climate research, and one that would take steps to ameliorate any negative impacts of climate change.

Weinberg's ideas about Exxon's possible role in climate science are rooted in an understanding of the company as already possessing significant scientific and technological expertise, which could then expand to include climate science. He envisioned a complex technical system of carbon dioxide tracking where "a worldwide network of land, sea, and air sampling systems" monitored atmospheric changes.[13] Exxon's global scale would enable to company to track climate change in ways that smaller organizations and countries could only dream of. Weinberg's plans relied on technology to understand climate changes. He speculated that "burning tagged carbon or some other technique for tracing the CO_2 path would be considered," and that "satellite systems, special analytical techniques, highly sophisticated measuring devices, etc." would be used as well.[14] Weinberg envisioned Exxon taking a lead role in climate change measurement and remediation. In his memo, he proposed, "Exxon's role might be that of initiator, management and technical consultant on a worldwide basis, and leader of the private sector in participating with governments."[15] Evident in Weinberg's proposals is the assumption that Exxon was a technical and scientific expert in petroleum-related issues.[16] If that

was the case, why shouldn't Exxon become not only an expert, but also a leader, in understanding, measuring, and ultimately combating climate change?

Unfortunately, Weinberg's vision outpaced realities at Exxon. Deputy manager of the science and technology department at Exxon's NYC headquarters, Walter R. Eckelmann, wrote to the company's board of directors about "Exxon's View and Position on 'Greenhouse Effect'" in 1980. Eckelmann was both responding to Weinberg and reporting to company executives when he explained, "The magnitude of the research effort required is beyond the resources and responsibility of any single company or industry, and must be addressed by the combined coordinated efforts of government, industries, and academia."[17] To Eckelmann, it was not necessary for Exxon to take the lead on climate science, especially since it was such a large-scale problem.

Eckelmann disagreed with Weinberg's dramatic vision for Exxon's leadership in climate science, though he did think Exxon should contribute research on the topic. He did not think that Exxon could approach the problem as comprehensively as Weinberg did, but he assured the executives that the science and technology department recognized climate change as a serious problem—one that Exxon should continue to monitor and research. In his 1980 letter, Eckelmann wrote, "Science and Technology feels that the build-up of carbon dioxide in the atmosphere is a potentially serious problem requiring the results of a huge worldwide research effort." Eckelmann agreed with Weinberg's basic premise: climate change is a serious problem, and the science and technology department will "support Corporate funding of this effort."[18]

Early efforts in climate science at Exxon were meant to supplement external research from other organizations, as well as contribute to and evaluate contemporary research on the topic. However, this effort did not overlook climate change's political significance. As Eckelmann noted in his letter, climate change research at Exxon should work with the Department of Energy's Office of CO_2 Effects, helping to provide the predictions they needed to create federal policies. He defined Exxon's climate research objectives in relation to this government program, writing, "The objective of Exxon's current research program in this area is to play a prominent role in critical component of the research program, actively follow the results of the overall program and to critically evaluate predictions of CO_2 effects as they are developed."[19]

Eckelmann's focus on shaping policy goals hints at Exxon executives' larger concerns about the implications of climate change research. In another letter from 1980, Edward E. David, head of ER&E, wrote to Senior Vice President George T. Piercy outlining ER&E programs that addressed the greenhouse effect. David downplayed the risks and rhetoric about climate change, asserting, "The 'greenhouse effect' is receiving widespread attention, based in part on dramatic claims and dire predictions that are appearing in the popular press."[20] David called for better data and more research, but also claimed that the work Exxon's researchers were doing was an important part of the process. Though he sheds some initial doubt on climate change threats, David highlights the political usefulness of Exxon's role in the research. David was no stranger to politics; he had served as President Richard Nixon's science advisor for three years in the early 1970s.[21] In his letter to Exxon's Senior Vice

Presidents, he asserted, "Exxon is in a unique position to provide leadership in a scientific subject of high significance to ourselves, the nation, and the world."[22] Perhaps because of climate science's political potential, it was important for Exxon to develop expertise in this emerging field.

That knowledge about climate change might encourage regulations on the oil industry was likely on the minds of Exxon executives. So the company did what it had done in the past: it worked to create its own experts on the issue in order to have a strongly informed perspective, and it provided the resources necessary for ER&E programs. ER&E internally spent $600,000 in 1979 to investigate whether fossil fuels or forest clearing was a more significant cause of rising carbon dioxide levels. Even though Harold Weinberg's ideas about Exxon becoming an innovative leader in global climate research never truly came to fruition, continued discussion about climate programs demonstrates the company's fluency with climate change issues in the late 1970s and early 1980s. The potential was there for Exxon to take on a far greater leadership role in climate science than it ever would.[23]

For the first few years of Exxon's climate science program, ER&E scientists developed innovative programs that strengthened the company's expertise in climate science. In 1979, the company outfitted a former oil tanker, the *Esso Atlantic*, with climate monitoring equipment. The goal was to use scientific measuring tools to monitor the amount of carbon dioxide in the air and oceans on a route stretching from the Gulf of Mexico to the Persian Gulf. [24] Though Exxon later claimed that those trips had no connection to climate research, scientists who worked on the program felt otherwise. Former Exxon scientist Edward Garvey believes that he was doing

"serious science" on the *Esso Atlantic*, and estimated that the program had an approximate budget of $1 million a year. Though other documents suggest that the budget was actually closer to $300,000, Exxon spent a significant amount of money attempting to track carbon dioxide levels.[25] Garvey remembers, "We were generating what we thought was state of the art information," investigating specifically how the oceans were absorbing carbon dioxide emissions. To these researchers, there was no question that carbon dioxide was changing the atmosphere. They hoped to figure out how quickly the effects would be felt and what Exxon might do to stop them.[26]

Exxon's researchers developed another innovative program to study this issue: the testing of vintage wines. Experts outside the company soon recognized Exxon's growing expertise. Exxon scientists, including Edward Garvey, planned a second project to investigate how much of the carbon dioxide that had been released into the atmosphere could be attributed to either the burning of fossil fuels or to deforestation. They would measure the chemical isotopes in one hundred bottles of vintage French wine, sampled only from vineyards with qualified data on historical growing conditions.[27] David Slade, who ran the Department of Energy's Carbon Dioxide and Climate Research Program, praised Exxon's innovative project. In a letter to ER&E's Henry Shaw, Slade wrote, "We congratulate (with some envy) Exxon's resourcefulness in selecting aged wines as the biological material."[28]

A report from 1980 describes how ER&E representatives actively participated in government investigations into climate research, as administrators suggested they should. The National Commission of Air Quality (NCAQ) was a congressional commission established by the 1977 Clean Air Act Amendments to investigate the

usefulness of the law and other possible methods of limiting air pollution.[29] At their meeting on carbon dioxide in 1980, Henry Shaw represented Exxon's climate research team and wrote a summary document of the meeting's findings. His report expresses some of the basic tenets of climate research and the issue's growing complexity. Global temperatures were rising because of increased atmospheric carbon dioxide from the combustion of fossil fuels. The potential consequences of climate change included global agricultural instability and rising sea levels due to Antarctic ice sheet melting.[30] The report also portrayed climate change as a serious problem without a quick technological solution. For example, Shaw describes, "In the next few decades, there are no likely technological 'fixes' (e.g., emission control devices or techniques) that will provide practical means of controlling CO_2 emissions resulting from combustion."[31] Shaw's report demonstrates his understanding of the complexity of climate change as a scientific and technological problem, and his report disseminated the complexity of climate change to others at Exxon.

The work of Exxon's scientists was on par with studies done by non-industry scientists in the early 1980s. In 1984, Exxon's researchers confirmed the scientific consensus that the combustion of fossil fuels caused global warming. Exxon scientists had calculated a similar increase in average temperatures because of increases in atmospheric carbon dioxide. Exxon's researchers added that the predicted rise in global temperatures would be more acutely felt at the poles. Greenhouse gasses could increase polar temperatures by ten degrees Celsius, and "could cause polar ice melting and a possible sea-level of 0.7 meter by 2080."[32] They also confirmed the average temperature increase of around two to three degrees Celsius. That Exxon's

researchers came to similar findings as scientists at other organizations demonstrates the scientific rigor of these early climate programs.

Exxon's climate data was so compelling that concerns over greenhouse gases influenced strategic business decisions during the 1980s. Specifically, concerns over escaping carbon dioxide shaped Exxon's decisions regarding the development of a field of natural gas buried deep underneath the South China Sea. The Natuna gas field is located deep underwater, approximately 700 miles north of Jakarta, Indonesia. It contains an immense amount of natural gas—an estimated forty-six trillion cubic feet of methane. To Exxon's misfortune, the Natuna gas field was also home to one 154 trillion cubic feet of assorted gases, most significantly carbon dioxide. Natural gas, just like crude petroleum, is often a mixture of hydrocarbon molecules, and refineries do the hard work of separating the valuable molecules from the less valuable ones.[33] Most of the gas at Natuna—71 percent—is carbon dioxide. Scientists were also worried about the high levels of hydrogen sulfide mixed in with the carbon dioxide and natural gas, a potent stimulator of acid rain. From the beginning of Exxon's interest in the gas field and their partnership with an Indonesian energy firm to develop it, disposal of the carbon dioxide and hydrogen sulfide remained a major problem.[34]

Over several years, Exxon scientists debated the best methods of disposal for the Natuna carbon dioxide. They explored options like flaring off the excess gases, sparging (a process which would slowly release the gases into the surrounding seawater through small holes in a six-mile underwater pipe), or re-injecting the waste carbon dioxide back into the Natuna formation after removing the valuable methane.

Each option had its own flaws, and for years Exxon could not figure out how to remediate the problem of the waste gases. Some plans tried to compensate for just releasing the gas. Researchers at Exxon calculated that if the company were to plant trees to accommodate for the release of the carbon dioxide into the atmosphere, they would need to plant enough to cover a piece of land equal to the size of Connecticut.[35]

In debating what to do about Natuna's greenhouse gases, Exxon administrators revealed their concerns about carbon dioxide and fears of being perceived as a major contributor to it. A group of scientists had assured Exxon's administrators that even though the possible output of the Natuna field was double than the emissions from the next largest industrial source of CO_2, "that the CO_2/SO_x emissions from the Natuna Project would not produce any significant adverse effects on the environment." Even though this opinion was the "majority view of credible experts," Exxon had its doubts.[36] "In view of substantial scientific complexities involved in both the greenhouse and acid rain phenomena," a background report on the Natuna Project confessed, "the results probably will not be universally accepted as being fully conclusive from a scientific standpoint."[37] Exxon's coordinator of environmental affairs, Alfred M. Natkin, expressed his concerns in a letter to the director of Esso Eastern, Richard L. Preston. Natkin argued that the carbon dioxide had to be disposed in a way that did not aggravate concerns of environmentalists. He wrote, "We feel it will be the most difficult to 'sell' given the rising level of concern in North American and Europe of the 'acid' rain issue and the emergence of the CO_2 'Greenhouse Effect' as a global environmental issue."[38] With Natuna, Exxon

demonstrated its awareness of the potential dangers of public misinterpretation of their role in increasing atmospheric carbon dioxide.

By 1980, ER&E had a plan to bring Exxon's climate change expertise to the foreground of the company's public relations efforts. That summer, three members of Exxon's climate change research team, Ed Wiley, Bob Barnum, and Mike Margolis, presented their ideas for "achieving national recognition on our CO_2 Greenhouse research project" in a comprehensive report titled the "CO_2 Greenhouse Effect Communications Plan." The three scientists worked with a public relations consultant to refine their ideas and create a plan to inform the public of their climate research. "ER&E's research program on the CO_2/Greenhouse Effect," they wrote, "offers an excellent vehicle to help achieve the corporate objective of improved recognition of Exxon as a center of scientific and technological excellence."[39] They understood that not only was their research innovative, it was also an example of the kind of scientific and technological expertise that Exxon was known for throughout the twentieth century.

ER&E's "CO_2 Greenhouse Effect Communications Plan" also overlapped with Exxon's stance on environmental issues more generally. Throughout the twentieth century, the company had portrayed itself as an expert in this area, especially relating to petroleum. Communicating this research could, as the plan outlined, "demonstrate Exxon's initiative in applying its scientific and other resources to help improve understanding or environmental manners." Here was a moment when Exxon's research could have changed how the company addressed climate issues for decades. This was a perfect opportunity for Exxon to become, as the plan described,

"a leading authority on CO_2/Greenhouse science, particularly among opinion leaders who are not scientists." The plan's authors recognized that creating a public relations campaign about their research would help sway public opinion away from those who would use this knowledge to further criticize the oil industry. Unlike the climate change denial rhetoric that would come in the decade to follow, the plan explicitly hoped to "bring about better public understanding of the CO_2/Greenhouse Effect."[40]

Here, Exxon had a chance to shape discussions on climate change in an educational fashion. The authors argued that sharing their research with the public was crucial for several reasons. First, publicizing their climate research would support Exxon's role as a scientific and technological expert. In addition, the research was important for scientists who had only recently begun to study the problem in earnest, and Exxon could participate in an international scientific effort to learn more about the global climate. Also, Exxon scientists recognized the potential for future regulations on fossil fuel use, which might limit fossil fuel consumption, and it would be important for Exxon to participate in those conservations as an expert voice. But perhaps most importantly, the authors argued, "It is significant to all humanity since, although the CO_2/Greenhouse Effect is not today widely perceived as a threat, the popular media are giving increasing attention to doom-saying theories about dramatic climate changes and melting polar icecaps."[41]

ER&E's "CO_2 Greenhouse Effect Communications Plan" incorporated fifteen methods that were aimed at reaching a broad swath of the American public, not just those who were scientifically literate. The plan proposed media briefings hosted by ER&E; the creation of non-technical background papers to be used in mailings for

media, government officials, and others; news releases, film clips, and magazine articles for non-Exxon publications; media interviews with researchers; media visitations to research laboratories; symposia; advertisements about Exxon's climate change research; including findings in executive speeches; sending researchers to give speeches at collegiate and professional societies; and giving testimonies to governmental bodies. Each of these methods targeted a different portion of the public and was designed to introduce them to Exxon's climate research. These plans demonstrate how researchers envisioned Exxon's role in society as a scientific and technological expert with a responsibility to share their research, especially when it was of this magnitude, with the public.[42]

Ultimately, however, Exxon implemented few if any of the methods outlined in the "CO_2 Greenhouse Effect Communications Plan." Though it was written for ER&E's Technology Feasibility Center manager Harold Weinberg, it is hard to know exactly who or what put an end to the plan's ideas. Handwritten notes on the document suggest almost immediate opposition. The copy of it currently available to researchers includes a stamp dated two weeks after Weinberg's office received it, suggesting time either for Weinberg to read and review the plan, or for it to be passed along to another administrator. Regardless, the author of the marginalia was not as convinced of the appropriateness of the suggested strategies as its authors. For example, a reader marked "no" next to six out of fifteen suggestions. Of the other nine suggestions, only five were marked "yes" without stipulating conditions to proceed.

In comparing what made the cut and what didn't, the author of the notes suggests that they weren't sure if Exxon's climate research deserved a large public audience. The writer allowed for news releases only "if we have something," and turned down the idea of creating film clips to send to news outlets, writing, "NO, of what?" The only ideas the writer completely approved of were those least likely to reach a large public audience: symposia at internal Exxon meetings, adding research materials to executive speeches, and creating mailings to send to scientists, opinion leaders, and government officials. As scientists at Exxon began to understand the implications of their research, so too did administrators, and their responses opposed the ethical goals of scientific research. In not publicizing its climate change research, they put the intellectual and ethical goals of scientific study behind their corporate agenda.[43]

Public information about Exxon's climate research is hard, though, not impossible to find in its public relations materials. In a 1981 editorial from the *Lamp*, Chairman of the Board of Trustees C. C. Garvin asserted that a transition to different fuels should be "evolutionary rather than revolutionary in nature."[44] Garvin's rhetoric of resistance to alternative fuels or regulations is not surprising. However, that he suggested a transition to sustainable fuels was significant. Later executives at Exxon viewed Garvin's policies, including investments in solar power and other alternative energies, as poor planning and pandering to political trends. Lee Raymond, who ran Exxon from 1993 to 2005 and was a prominent climate change denier, criticized Garvin for accepting the existence of climate change and the emergence of alternative fuels.[45] Even so, Garvin's public discussions of climate change were rare and were

not a part of his main approach to environmental issues. In a singular speech at Vanderbilt University in 1984, Garvin remarked briefly that the greenhouse effect might "presumably lead to an increase in global temperatures with attendant consequences."[46] Garvin's statement here stands out among the public examples of Exxon's environmental strategies. Largely, Exxon remained silent, not mentioning its climate research publicly through the late 1970s and early 1980s.[47]

Efforts to prevent widespread publication of Exxon's climate programs only briefly presaged major funding cuts to carbon dioxide research. Exxon began to cut funding to climate science programs in 1982. These initial cuts were sudden and significant. Alfred Natkin wrote to Harold Weinberg to let him know of pending budget changes. In a letter from June 1982, Natkin informed Weinberg that the program's budget "should be no more than $150k/per year beginning July 1, 1982."[48] The budget had previously been $900,000 per year.[49] Changing the budget so drastically in such a short period was likely a shock to Weinberg, who had championed climate science at Exxon from the very beginning.

A report from January of 1981 reveals that Exxon's contract research office recommended prohibiting expansions to the program, precipitating the funding cuts in 1982. The report's author, R. E. Barnum, wrote that expanding programs "did not offer significantly increased benefits" and "require skills which are in limited supply, and would require additional funds on the part of Exxon since Government funding seems unlikely."[50] The report claimed that a decrease in financial support from the federal government encouraged prohibiting expansions.[51] The availability of government funding for private industry research projects in climate science likely

made Exxon's initial programs more appealing. The loss of those funds meant that Exxon would have to foot the entire research bill. Barnum offered two reasons for the loss of federal funding: "the tightening up of the federal budgets, and Exxon's competition with the academic community for contract funds."[52] Here, Exxon positioned itself as a competitor for resources in investigating climate science, and seemed to defer the development of large-scale research projects to academic institutions instead of private industry.[53] Such reasoning reflects that idea that Exxon's research and development program budget was tight. It wasn't. In 1981, Exxon had an annual budget of $600 million per year for research and development.[54] It's just that researching climate change wasn't as much of a priority to Exxon administrators as other projects were.

Although the budget cuts did not eliminate climate science at Exxon, the program was now drastically limited, and ER&E's innovative experiments were the first to go. Natkin asserted that $150,000 was sufficient to "support a resident source of scientific expertise on all phases and aspects of the CO_2 Green House effect."[55] Such an amount would be enough to keep Exxon "abreast of developments."[56] Natkin also informed Weinberg that the program could no longer afford to carry out expensive, multi-year programs like those aboard the *Esso Atlantic*. In fact, Natkin specifically recommended this program for cancelation, asserting, "It is Science and Technology's view that the CO_2 sampling program utilizing Exxon tankers should not be reinstated."[57] Not only was the program too expensive, Weinberg would also no longer be able to rely on the availability of Exxon tankers for his group's research.[58]

Research from 1982 reflects this smaller, less experimental program. Whether intentional or not, researchers began to highlight the uncertainty in climate science more frequently.[59] At a conference in 1984, Henry Shaw argued, "There is adequate time to study the problem. Legislation is premature."[60] He had asserted this idea, almost verbatim, in an internal document in 1981.[61] In addition, Andrew Callegari, who was director of Exxon's climate research programs, declared in a 1981 presentation on climate science to colleagues, "The validity of models are not established," and the "complexity of carbon cycle and climate system require many approximations."[62] Such qualifying statements highlighted the uncertainty in climate science. Shaw and Callegari's recommendations are in sharp contrast to scientists at MIT, who said that we must start to act on this information, encourage national legislation and global dialogue on this issue, and move quickly to remediate the effects of global warming.[63]

By the late 1980s, Exxon's internal awareness of the significance of climate change did not match their public relations efforts. News of Exxon's climate science research did not infiltrate the *Lamp* or any other public relations magazines through the middle of the 1990s. Even so, Exxon continued to cultivate a reputation for scientific and technological expertise in its public relations materials without mentioning its climate science research. For example, a 1985 article in *Exxon USA* praised the work of company scientists tracking environmental pollutants. "Finding the Pollution Needle in the Environmental Haystack" described, in the author Lawrence Locke's words, how corporate scientists were "high-tech detectives," sleuthing out petrochemicals in environmental samples. One scientist, Saul Blum,

who conducted research at ER&E in Linden, explained his work through several scenarios: "Perhaps a refiner wants to process water tested to see if it is clean enough to return to the environment," or Blum and his researchers would test "a dollop of ocean water containing some crude oil" and try to determine whose oil it was, where it came from, and when it was spilled. Using Blum as an example, Locke portrays Exxon as part of the solution to environmental concerns, with company scientists working to protect public health and "advancing the effort to conserve the environment." Exxon's scientists were an integral part of the solution to the pollution issues, Locke claims, because of their exceptional scientific and technological practices. He concludes, "Through modern technology and scientific insight, they are detecting and measuring possibly harmful substances so that society may deal effectively with them."[64] Exxon's continued public relations push to appear as an environmental expert eventually played a role in how it addressed climate change.

Throughout Exxon's long history, the *Lamp*, its quarterly magazine for shareholders, presented Exxon's opinions on a wide range of issues. However, the *Lamp* didn't address climate change until 1996, and even then cast doubt onto the work of climate scientists. In the fall 1996 issue, an editorial by CEO Lee Raymond broached a discussion of climate change in the magazine. Raymond argued, "Achieving economic growth remains one of the world's critical needs," and "poorly considered action on climate change could inflict severe economic damage." He admitted, "The atmospheric concentration of greenhouse gases is increasing," but qualified his statement with, "96 percent of the carbon dioxide entering the atmosphere is produced by nature and it beyond our control." Climate change, to

Raymond, had become a "political issue" whose "high costs [were] ignored." Raymond urged that the program be investigated more deeply and said, "Exxon is conducting its own research" on the issue.[65]

Climate change appears in the *Lamp* only after Raymond took a more aggressive stance in the public debate over global warming. Scholars have documented Exxon's role in fostering climate change skepticism and Raymond has been the most notable voice at the company, leading the charge. [66] He used the power of Exxon and the significance of its public standing as a private but prominent scientific research institution to distract from the credibility of other scientists' work.[67] Significantly, his opinions on climate science shaped Exxon's public relations.[68]

From that 1996 issue where Raymond's editorial first addressed climate change head-on, the *Lamp* became another tool in Exxon's arsenal to challenge the emerging scientific consensus on climate change. Over the next few years, the *Lamp* published articles with leading titles, such as, "Global Warming: What to Think, What to Do," "Viewpoint: The U.N. Global Climate Treaty Isn't Global and Won't Work," and "MIT Professor Says Product of Politics, Kyoto Pact Sidesteps Science, Economics."[69] Each of these articles presented arguments seemingly based in Exxon's scientific and technological expertise, urging readers to challenge prevailing ideas about the role of fossil fuels in creating climate change and the predicted outcomes in rising global temperatures.

"Global Warming: What to Think, What to Do" literally tells its readers what to think about climate change—that it's not as big of a problem as others might

suggest—and what to do about it: nothing. In the 1996 article, author Jonathan H. Adler presented readers with several counterpoints about climate change and supported them with arguments seemingly based on science. For example, Adler claimed, "Increases in global temperature may or may not be a sign of global warming." He supported this uncertainty by telling readers that scientists are aware of centuries-long temperature fluctuations that have occurred throughout the planet's history. "Satellite measurements," he argued, "which can record tiny temperature fluctuations caused by the reflection of sunlight off the moon have shown absolutely no warming trend over the past 17 years." Here, Adler uses technology to drive his argument. The impressive imagery of satellites capturing Earth's climate measurements assures readers that Exxon's opinions are supported by the most advanced technology available.[70]

"Global Warming: What to Think, What to Do" also used graphs and imagery to convince readers that it had science and technology on its side. Figure 1 depicts a graph included in the article, which describes historical temperature fluctuations. Titled "Taking the World's Temperature," the graph demonstrates three sets of data: satellite readings in the jagged red line, a temperature trend in a solid, slightly declining purple line, and a computer prediction in a dotted green line leading slightly upwards. A short description claims, "Contrary to computer predictions, precise satellite measurements show no warming trend." Exxon's mastery of environmental data is on display here, as the graph privileges satellite data over computer predictions, asserting that one type of scientific data has more authority in the debate than another. The jaggedness of the satellite predictions also seems to disrupt the idea

that global temperature rates are fixed or stable. The graph overall encourages skepticism about some central claims made by climate scientists: that the planet was warming and that computer models can reliably predict potential temperature increases.

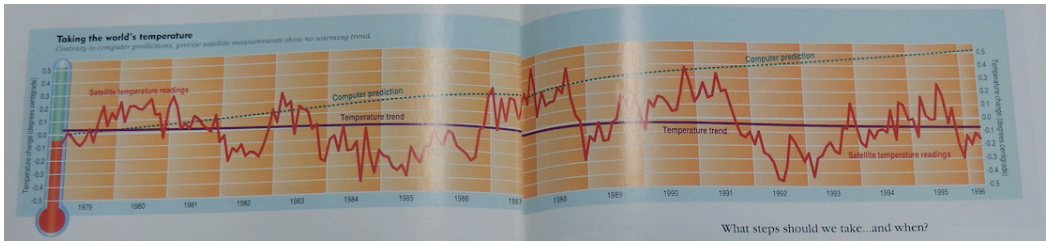

Figure 19 – "Taking the World's Temperature" displayed global temperature fluctuations from 1979 through 1996 in an attempt to convince readers to not be so worried about slight increases or decreases. Bill Corporan, "Taking the World's Temperature" in Jonathan H. Adler, "Global Warming: What to Think, What to Do," *Lamp* 78, no. 3 (Fall 1996): 22-25, Box 2.207/D87, EMHC.

Other articles in the *Lamp* from the late 1990s demonstrate Exxon's use of its expertise to support its challenges to climate change. In "Taking the Earth's Temperature," the author Bill Corporan, used Exxon's fluency in scientific environmental data to continue its arguments against the legitimacy of concerns about climate change. In contrast to "Global Warming: What to Think, What to Do," "Taking the Earth's Temperature" created a narrative around climate scientists testing ice core samples in Antarctica. It also described how scientists associated with meteorological societies had set up climate-monitoring stations across the globe. However, the article privileged the data gained from scientists using satellites, asserting as earlier articles have, that "satellite readings bring into question some computer models that predict global warming."[71] Here, the assumption is that better technology reveals that climate change is a false threat.

Articles from the *Lamp* in the late 1990s also used Exxon's reputation for expertise to argue against the United States signing the Kyoto Protocol in 1997. The United States controversially failed to sign the international climate treaty, and articles in the *Lamp* lobbied for that decision using Exxon's scientific and technological expertise to weigh in on federal policy.[72] One such piece, "Global Climate Treaty Isn't Global, Won't Work," argued that advocates of international restrictions on fossil fuel use are "needed because burning fossil fuels cause global warming. That, however, is a belief, not a proven fact." The author claimed that humans were responsible for only a small amount—4 percent—of greenhouse gases. Using a percentage here suggests scientific precision in the author's reasoning. The article also argues that the ice ages are a "good example" of "natural fluctuations in [Earth's] climate," attempting to place concerns of global warming against periods of global cooling. The author concluded by asserting, "Even if some form of action is needed, it would be irresponsible for the world's developed nations to rush into binding, ill-conceived obligations based on vague science and loaded with severe economic consequences, especially when there is plenty of time to do things right."[73]

A longer article, "The 7 Percent Solution That Isn't: Plain Talk About Kyoto and Global Climate Change" from the Spring 1998 issue of the *Lamp*, claims to speak plainly but relies on statements from experts on climate change within the oil industry. Here, Exxon actively claims that oil industry representatives can be climate change experts, especially if they disagree with those who support climate change. Bill Corporan, author of this article and many other anti-climate change pieces in the *Lamp*, claimed that Bill O'Keefe, executive vice president of the American Petroleum

Institute, was "an authority on global climate change." O'Keefe paints his expertise in stark contrast to environmentalists at the Kyoto meeting. "It was not a balanced conference," Corporan quotes O'Keefe, "where you had energy, finance, and environmental people trying to figure out how to address the issue of global climate change." Expert voices from finance and the oil industry, O'Keefe claims, should be given equal weight to environmentalists' perspectives. Instead, O'Keefe asserts, "It was an environmental conference, and it was led by people who believed they had been anointed to save the planet." O'Keefe depicted environmentalists as non-experts whose arrogance overruled the more practical voices from finance and the oil industry. Accordingly, he asserted, "The petroleum industry is making major investments in developing new more fuel-efficient technology that is also environmentally sound." The contrast here pits environmentalists focused on international treaties against the oil industry, whose advanced technologies protect the environment.[74]

This history of what Exxon knew about climate change adds a slight twist to the history I've analyzed so far in this dissertation. As discussed in Chapter 4, Exxon used its petrochemical expertise to argue that it was an expert in environmental problems related to pollution. Yet, the company did not capitalize on its scientific efforts in climate science to claim that it had climate science expertise. Nor did it use such expertise to claim that Exxon had a right to a voice in the public discussions about climate change. In fact, the company missed an opportunity to use its expertise to fight climate change. Instead, it chose to use that expertise in arguments against the legitimacy of climate science. Exxon did not make public its climate change research

in the late 1970s and early 1980s, and the company did not use its scientific expertise in climate research to support its role in these debates. Exxon did not use its expertise in climate science in their interactions with the public either. It actively avoided becoming a climate science expert, in stark contrast to a tradition of cultivating a reputation as the expert in scientific and technological issues. Instead, Exxon used its environmental, scientific, and technological expertise to give weight to challenges against the legitimacy of climate science. It actively used its scientific and technological expertise to cast doubt on climate change science after the mid-1980s.

There are questions about Exxon's decision making here that I cannot answer. Unfortunately, I do not have the documents that explain why Exxon's senior leadership made the decision to reduce ER&E's climate program funding in the early 1980s. Nor do I have access to documents that explain why Exxon choose to use its expertise to pursue climate change denial policies and politics. Though I cannot claim to know why this happened, the consequences of Exxon's role in shaping the climate change debate are ongoing and may reveal some of the answers to these questions.

In September 2015, *InsideClimate News* and the *Los Angeles Times* uncovered documents, including the 1977 report from Black, proving that Exxon had known that combustion of fossil fuels caused climate change since the late 1970s, and that it had funded internal climate science programs since 1979. Researchers at both organizations reported that Exxon scientists were once on the leading edge of climate science research.[75] In 2017, historians Naomi Oreskes and Geoffrey Supran asserted that ExxonMobil's scientists "predominantly acknowledged that anthropogenic global warming is real, human-caused, serious, and solvable, while recognizing

uncertainties."[76] They also confirm, "ExxonMobil internally acknowledged the business threat and uncertainties of anthropogenic climate change." [77] This stands in stark contrast to their history of public climate change denial.

This news has incited harsh criticism. Environmental activists began using the #ExxonKnew hashtag to call out Exxon on social media platforms, and the revelation that Exxon knew about climate change has created significant outrage.[78]A month after the *InsideClimate News* report, Vermont senator Bernie Sanders called for the Department of Justice to investigate Exxon for fraud.[79] Under pressure from stockholders, the corporation agreed to shareholder demands to disclose climate change's risks to their core business in 2017.[80] The company currently faces litigation from two states. Attorney General of New York Eric Schneiderman and Attorney General of Massachusetts Maura Healy are investigating Exxon for knowingly misleading the public.[81] A group of coastal communities in California filed a civil suit against Exxon and 35 other oil companies for their role in creating sea-level rise. The four cities and three counties argue that oil companies need to pay for infrastructure upgrades to protect against sea-level rise.[82] The results of this litigation may lead us to an answer regarding whether climate change irreparably damages Exxon's reputation for environmental expertise.

CONCLUSION

My project aspires to be a history that is useful for those living in a post-petroleum world. What I mean by that is, I hope it helps to answer the questions: what can historians tell a world struggling with the effects of climate change? How can we tell stories that are useful for understanding the history of petroleum and petroleum pollution? And what can these stories do to help?

In order to provide some answers to these questions, "Crude Conservation" explores how two of Standard Oil's refineries—located in Bayonne and Linden, New Jersey, and each operating for over one hundred years—contributed significantly to the environmental changes wrought by oil. I chose these refineries specifically for their crucial role in the production of petroleum products over the course of the late-nineteenth and twentieth centuries. They were important facilities in Standard Oil of New Jersey's petroleum refining network, and have profoundly affected New Jersey, the larger New York metropolitan region, and ultimately, the global crisis that is climate change.

In "Crude Conservation," I demonstrate that oil refineries are important for historians to study because they are the sites of the material transformation of crude oil to petroleum product. This material transformation has made petroleum useful to society and thus enabled its widespread and environmentally devastating application. For too long, oil scholars have investigated only the extraction of raw crude and the consumption of petroleum products. My work joins the few scholarly voices interested in how crude oil became petroleum products, and the

significant consequences of that transformation. Hopefully, this project (and others) will help create a more complex narrative about how modern society became intricately tied to the consumption of petroleum.

Investigating the environmental and technological histories of refineries can reveal useful narratives with the potential to help unravel our addiction to oil. My research has uncovered how Standard Oil of New Jersey, now known as ExxonMobil, created a reputation for scientific and technological expertise that was based both on the creation of petrochemicals and industrial conservation methods employed at company refineries. Both of these developments were used as fodder for public relations materials in which the company worked to create an image of itself as a scientific and technological expert in the field.

Standard Oil of New Jersey created this expert persona with an explicit purpose. I argue that the company used this reputation for expertise to participate in and ultimately shape debates over what to do about oil pollution. Standard Oil of New Jersey worked hard to convince Americans that it was not creating, but rather solving, environmental problems. This logic enabled the company to directly participate in policy discussions throughout the twentieth century as renowned specialists.

The problem with Standard Oil's reasoning, however, is that it is a bit like letting the fox guard the hen house. In facing environmental problems over the course of the twentieth century, we as a society have privileged technical knowledge and that has given Standard Oil, now ExxonMobil, an advantage. Unfortunately, Exxon's insistence on its environmental expertise and our

willingness to believe it has made climate change that much more difficult to resolve.

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Notes to the Introduction

[1] "The Inflation Calculator," Westegg.com, accessed March 8, 2018, https://westegg.com/inflation/.

[2] "Oil Explosion: Another Blaze at the Works of the Standard Oil Company," *Bayonne Herald*, February 19, 1881.

[3] "Oil Explosion."

[4] "Oil Explosion."

[5] Over the course of the twentieth century, the company went by many names. It was known as Standard Oil before 1911, as Standard Oil of New Jersey (SONJ) after 1911, as Esso at midcentury, as Exxon in the 1970s, and finally as ExxonMobil after it merged with Mobil in 1999—and this list does not include the various affiliates through which the corporation operated. Throughout the dissertation, I have tried to stay true to the name the company used for itself during the time I am discussing. For the majority of this project, I use the term Standard Oil of New Jersey. For a guide to company name-changes through 1973, see "Leadership in Petrochemicals: The Story of Exxon Chemical Company," special issue, *Chemsphere* (Fourth Quarter 1998): 4-12, Box 2.207/H19a, Exxon Mobil Historical Collection, Dolph Briscoe Center for American History, University of Texas at Austin (hereafter EMHC).

[6] Ottinger relies on the work of Thomas E. Gieryan for this working definition of expertise. Gwen Ottinger, *Refining Expertise: How Responsible Engineers Subvert Environmental Justice Challenges* (New York: New York University, 2013), EN38, 191; Thomas E. Gieyran, *Cultural Boundaries of Science: Credibility on the Line* (Chicago: University of Chicago Press, 1999).

[7] After a judge ruled that ExxonMobil was liable, the case went to trial to determine how much ExxonMobil would have to pay in 2014. But before the judge could render a verdict, Republican governor Chris Christie's office announced a settlement with ExxonMobil for $250 million. The settlement has elicited outrage at Christie's seemingly blatant political cronyism. The story, however, is more complicated. In the spring of 2008, Democratic governor John Corzine's administration offered the company a settlement of $550 million. This

happened before a 2009 decision in which a judge denied ExxonMobil's claims that it was only liable for contamination that occurred after passage of the 1976 New Jersey Spill Compensation and Control Act. The act was model legislation for the Comprehensive Environmental Response, Compensation, and Liability Act, otherwise known as the Superfund Act. Afterwards, the state strengthened its charge for the full claims of the lawsuit, and settlement talks went quiet until the Christie administration took over the case. A review of financial records show that in 2014, ExxonMobil donated $500,000 to the Republicans Governor's Association, which Christie then chaired. Shortly after the announcement of the Christie settlement, Bradley M. Campbell, former head of the New Jersey Department of Environmental Protection and former administrator of the U.S. Environmental Protection Agency's mid-Atlantic Region, wrote an op-ed piece for the *New York Times* about the settlement. He charged that Christie's chief counsel, Christopher Porrino, muscled his way into the negotiations in order to influence the outcome. Jeff Tittel, president of the Sierra Club in New Jersey, and State Senator Raymond both criticized Governor Christie's office for settling the case. Only $50 million of the settlement is dedicated to cleaning the sites; the rest will be funneled towards the state's operating budget deficit. The settlement also addresses ExxonMobil's liability at 16 other sites in New Jersey and at all former Exxon gas stations across the state, releasing the corporation from liability at hundreds of sites that have yet to be thoroughly investigated. On top of all that, the settlement allows ExxonMobil to escape from formally admitting any wrongdoing. Bipartisan attempts by the New Jersey governor's office to settle the pollution case hint at the complicated relationship between oil companies and local governments, and the possible consequences for local people, refinery employees, and the environment. The lawsuit also demonstrates NJDEP's frustration in dealing with Exxon's inaction to clean up decades of environmental damage, and possibly similar frustrations at the political and economic systems shaping the discussion of how to deal with environmental pollution in general. Susan Bass, *An Analysis of State Superfund Programs: 50-State Study, 1998 Update* (Washington, DC: Environmental Law Institute, 1998), 1; Bradley M. Campbell, "Shortchanging New Jersey by Billions: Chris Christie's Exxon Settlement is Bad for New Jersey," *New York Times*, March 4, 2015, http://www.nytimes.com/2015/03/05/opinion/chris-christies-exxon-settlement-is-bad-for-new-jersey.html?smid=tw-share&_r=0; Republican Governors Association, "Contributions from Exxon," Open Secrets.org, http://www.opensecrets.org/527s/527cmtedetail_donors.php?url=527cmtedetail_donors.php%3Fcycle%3D2014%26ein%3D113655877&cname=exxon&ein=113655877&cycle=2014; New Jersey Department of Environmental Protection and Administrator, New Jersey Spill Compensation Fund vs. ExxonMobil Corporation and AGC Chemicals Americas, Inc., Civil Action, Superior Court of New Jersey, August 18, 2004; S. P. Sullivan, "State Announces Settlement in Controversial ExxonMobil Pollution Case," NJ.com, March 5, 2015, http://www.nj.com/news/index.ssf/2015/03/state_announces_settlement_in_controversial_exxon.html; S. P. Sullivan, "Exxon Lawyer: $8.9B pollution damage

claim came 'out of thin air,'" NJ.com, April 15, 2015, http://www.nj.com/news/index.ssf/2015/04/exxon_lawyer_89_billion_pollution_damage_claim_cam.html#incart_related_stories; S. P. Sullivan, "New Details in $225 Exxon Pollution Settlement Made Public Today," NJ.com, April 6, 2015, http://www.nj.com/news/index.ssf/2015/04/historic_settlement_with_exxon_includes_polluted_r.html; Benjamin Weiser, "Exxon Settles $9 Billion Pollution Case in New Jersey for Far Less," *New York Times*, February 27, 2015, http://www.nytimes.com/2015/02/28/nyregion/exxon-mobil-settles-with-new-jersey-over-environmental-damage.html?_r=0; Benjamin Weiser, "Under Law, Christie Can Use Exxon Settlement to Help Balance Budget," *New York Times*, March 2, 2015, http://www.nytimes.com/2015/03/03/nyregion/under-law-christie-can-use-exxon-settlement-to-help-balance-budget.html?_r=0; Benjamin Weiser and Kate Zernike, "Christie Administration Deal With Exxon Was Years in the Making," *New York Times*, March 18, 2015, http://www.nytimes.com/2015/03/20/nyregion/christie-administration-deal-with-exxon-was-years-in-the-making.html?hp&action=click&pgtype=Homepage&module=second-column-region&region=top-news&WT.nav=top-news&_r=0.

[8] Maxine N. Lurie and Richard Veit, *New Jersey: A History of the Garden State* (New Brunswick, NJ: Rutgers University Press, 2012).

[9] Lurie and Veit, *New Jersey*, 3-4.

[10] A few examples of works on colonial New Jersey are: Alfred Hoyt Bill, *New Jersey and the Revolutionary War* (Princeton: Van Nostrand, 1964); John T. Cunningham, *The Uncertain Revolution: Washington & the Continental Army' at Morristown* (West Creek, NJ: Down the Shore Publishing, 2007); Larry Gerlach, *Prologue to Independence: New Jersey in the Coming of the American Revolution* (New Brunswick, NJ: Rutgers University Press, 1976); Barbara Mintick, ed., *New Jersey in the American Revolution* (New Brunswick: Rutgers University Press, 2005); Richard P. McCormick, *New Jersey from Colony to State, 1609-1789* (Princeton: Van Nostrand, 1964); John Pomfret, *Colonial New Jersey: A History* (New York: Scribner, 1973).

[11] Lizabeth Cohen, *A Consumer's Republic: The Politics of Mass Consumption in Postwar America* (New York: Knopf, 2003); Howard Gillette Jr., *Camden After the Fall: Decline and Redevelopment in a Post-Industrial City* (Philadelphia: University of Pennsylvania Press, 2005); Kevin Mumford, *Newark: A History of Race, Rights, and Riots in America* (New York: New York University Press, 2008); Ronald Porambo, *No Cause for Indictment: An Autopsy of Newark* (Hoboken: Melville House, 1971); Joel Schwartz and Daniel Prosser, eds., *Cities of the Garden State: Essays in the Urban and Suburban History of New Jersey* (Dubuque, IA: Kendall/Hunt, 1977).

[12] Neil Maher explains the dichotomy between popular opinion about the type of place New Jersey is and the lived experiences of New Jerseyans and their rich and varied landscapes in Neil M. Maher, "Nature's Next Exit? Or Why New Jersey Is As Important As Yellowstone National Park," in Neil M. Maher, ed., *New*

Jersey's Environments: Past, Present, and Future (New Brunswick, NJ: Rutgers University Press, 2006).

[13] Many authors have attempted to counter these popular conceptions of environmental degradation in the state. For a great example of an author beating back this trend, see Richard Lathrop, *The Highlands: Critical Resources, Treasured Landscapes* (New Brunswick, NJ: Rutgers University Press, 2011).

[14] United States Environmental Protection Agency, "New Jersey Sites," accessed April 16, 2015, http://www.epa.gov/region2/cleanup/sites/njtoc_name.htm; New Jersey Department of Environmental Protection, "Site Remediation Program: Active Sites with Confirmed Contamination," updated April 12, 2012, http://www.state.nj.us/dep/srp/kcsnj/.

[15] Maher, *New Jersey's Environments*, 4.

[16] Journalists and scientists have taken up the call to document New Jersey's toxic places by writing their own histories. Susanne Antonetta, *Body Toxic: An Environmental Memoir* (Washington, DC: Counterpoint, 2001); Thomas Belton, *Protecting New Jersey's Environment: From Cancer Alley to the New Garden State* (New Brunswick, NJ: Rutgers University Press, 2011); Mary Bruno, *An American River: From Paradise to Superfund, Afloat on New Jersey's Passaic* (Vashon, WA: DeWitt Press, 2012); Dan Fagin, *Toms River: A Story of Science and Salvation* (New York: Bantam Books, 2013).

[17] Nicolas Kusnetz, "2017 One of the Hottest Years on Record, and without El Niño," *Inside Climate News*, January 19, 2018, https://insideclimatenews.org/news/18012018/2017-third-hottest-year-record-wildfires-hurricanes-noaa-nasa-annual-climate-change-report.

[18] Karen Merrill, "The Risks of Dead Reckoning: A Postscript on Oil, Climate Change, and Political Time," *Journal of American History* 99, no. 1 (June 2012): 252.

[19] Merrill, "Risks of Dead Reckoning," 252.

[20] My work also builds on the literature about Standard Oil. While writers have chosen Standard Oil as a topic since the late nineteenth century, much of that work focuses on organizational and corporate history, technological change, global political and economic power, events surrounding the breakup of the Standard Oil Trust in 1911, or critiques of the company's competitive business practices. Ron Chernow, *Titan: The Life of John D. Rockefeller, Sr.* (New York: Random House, 1998); Steve Coll, *Private Empire: ExxonMobil and American Power* (New York: Penguin Press, 2012); George Sweet Gibb and Evelyn H. Knowlton, *The Resurgent Years, 1911-1927: History of Standard Oil Company (New Jersey)* (New York: Harper, 1956); Henrietta M. Larson, *New Horizons, 1927-1950: History of Standard Oil Company (New Jersey)* (New York: Harper and Row, 1971); Upton Sinclair, *Oil! A Novel* (New York: Penguin Books, 2007); Peter H. Spitz, *Petrochemicals: The Rise of an Industry* (New York: John Wiley, 1988); Ida M. Tarbell and David Mark Chalmers, *The History of the Standard Oil Company* (New York: Harper and Row, 1966); Bennett H. Wall, C. Gerald Carpenter, and Gene S. Yeager, *Growth in a Changing Environment: A History of Standard Oil Company (New Jersey), Exxon Corporation, 1950-1975* (New York:

McGraw-Hill, 1988); Daniel Yergin, *The Prize: The Epic Quest for Oil, Money, and Power* (New York: Simon and Schuster, 1991).

[21] Brian Black, "Oil for Living: Petroleum and American Conspicuous Consumption," *Journal of American History* 99*,* no. 2, (2012): 40-50; Robert Johnson, *Carbon Nation: Fossil Fuels in the Making of American Culture* (Lawrence: University of Kansas Press, 2014), xx; Matthew Huber, *Lifeblood: Oil, Freedom, and the Forces of Capital* (Minneapolis: University of Minnesota Press, 2013)*,* xiv-xv; Roger M. Olien and Diana Davids Olien, *Oil and Ideology: The Cultural Creation of the American Petroleum Industry* (Chapel Hill: University of North Carolina Press, 2000).

[22] Though not exhaustive, the list below is an interdisciplinary accounting of works related to the history of toxicity in the environment and the bodily harm resultant from exposure to toxic substances. Soraya Boudia and Nathalie Jas, *Powerless Science? Science and Politics in a Toxic World* (New York: Berghahn Books, 2014); Kate Brown, *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters* (New York: Oxford University Press, 2013); Theo Colborn, Dianne Dumanoski, and John Peterson Myers, *Our Stolen Future: Are We Threatening Our Fertility, Intelligence, and Survival? A Scientific Detective Story* (New York: Dutton, 1996); Carl F. Cranor, *Legally Poisoned: How the Law Puts Us at Risk from Toxicants* (Cambridge, MA: Harvard University Press, 2011); Frederick Rowe Davis, *Banned: A History of Pesticides and the Science of Toxicology* (New Haven: Yale University Press, 2014); James Rodger Fleming and Ann Johnson, *Toxic Airs: Body, Place, Planet in Historical Perspective* (Pittsburgh: University of Pittsburgh Press, 2014); Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES* (New Haven: Yale University Press, 2011); Nancy Langston, "Gender Transformed: Endocrine Disruptors in the Environment" in *Seeing Nature through Gender*, ed. Virginia Scharff (Lawrence: University of Kansas Press, 2003); Gerald E. Markowitz and David Rosner, *Lead Wars: The Politics of Science and the Fate of America's Children* (Berkeley, CA: University of California Press, 2013); Gerald E. Markowitz and David Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution* (Berkeley, CA: University of California Press, 2002); Michelle Murphy, *Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Technoscience, and Women Workers* (Durham, NC: Duke University Press, 2006); Linda L. Nash, "Purity and Danger: Historical Reflections on the Regulation of Environmental Pollutants," *Environmental History* 13, no. 4 (2008): 651-58; Linda L. Nash, *Inescapable Ecologies: A History of Environment, Disease, and Knowledge* (Berkeley, CA: University of California Press, 2006); Josiah Rector, "Environmental Justice at Work: The UAW, the War on Cancer, and the Right to Equal Protection from Toxic Hazards in Postwar America," *Journal of American History* 101, no. 2 (September 2014): 480-502; Benjamin Ross and Steven Amter, *The Polluters: The Making of Our Chemically Altered Environment* (New York: Oxford University Press, 2010); Dayna Nadine Scott, *Our Chemical Selves: Gender, Toxics, and Environmental Health* (Vancouver: University of British Columbia

Press: 2015; Christopher Sellers, "Discovering Environmental Cancer: Wilhelm Hueper, Post-World War II Epidemiology, and the Vanishing Clinician's Eye," *American Journal of Public Health* 87, no. 11 (1997): 1824-35; Christopher C. Sellers, *Dangerous Trade: Histories of Industrial Hazard across a Globalizing World* (Philadelphia: Temple University Press, 2012); Christopher C. Sellers, *Hazards of the Job: From Industrial Disease to Environmental Health Science* (Chapel Hill: University of North Carolina Press, 1999); Helen E. Sheehan and Richard P. Wedeen, *Toxic Circles: Environmental Hazards from the Workplace into the Community* (New Brunswick, NJ: Rutgers University Press, 1993); Joel A. Tarr, "Toxic Legacy: The Environmental Impact of the Manufactured Gas Industry in the United States," *Technology and Culture* 55, no. 1 (January 2014): 107-47; Sarah A. Vogel, "From 'The Dose Makes the Poison' to 'The Timing Makes the Poison': Conceptualizing Risk in the Synthetic Age," *Environmental History* 13, no. 4 (2008): 667-73; Sarah A Vogel, *Is It Safe? BPA and the Struggle to Define the Safety of Chemicals* (Berkeley: University of California Press, 2013); Brett L. Walker, *Toxic Archipelago: A History of Industrial Disease in Japan* (Seattle: University of Washington Press, 2010); Christian Warren, *Brush with Death: A Social History of Lead Poisoning* (Baltimore, MD: Johns Hopkins University Press, 2000); Barbara Young Welke, "The Cowboy Suit Tragedy: Spreading Risk, Owning Hazard in the Modern American Consumer Economy," *Journal of American History* 101, no. 1 (June 2014): 97-121.

[23] Some notable works in the field of environmental justice are Joni Adamson, Mei Mei Evans, and Rachel Stein, *The Environmental Justice Reader: Politics, Poetics & Pedagogy* (Tucson: University of Arizona Press, 2002); Luke W. Cole and Sheila R. Foster, *From the Ground Up: Environmental Racism and the Rise of the Environmental Justice Movement* (New York: New York University Press, 2001); Richard Hofrichter, *Toxic Struggles: The Theory and Practice of Environmental Justice* (Philadelphia: New Society, 1993); Dorceta E. Taylor, *Environmental and Social Justice an International Perspective* (Bingley, UK: Emerald, 2010); Dorceta E. Taylor, *Toxic Communities: Environmental Racism, Industrial Pollution, and Residential Mobility* (New York: New York University Press, 2014).

[24] Stephanie LeMengaer, *Living Oil: Petroleum Culture in the American Century* (New York: Oxford University Press, 2014), 22.

[25] Christopher F. Jones, *Routes of Power: Energy and Modern America* (Cambridge, MA: Harvard University Press, 2014).

[26] Hugh S. Gorman, *Redefining Efficiency: Pollution Concerns, Regulatory Mechanisms, and Technological Change in the U.S. Petroleum Industry* (Akron, OH: University of Akron Press, 2001), xiii.

[27] Gorman, *Redefining Efficiency,* 1-7.

[28] Samuel P. Hays, *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920* (Pittsburgh: University of Pittsburgh Press, 1959), 2.

[29] Hays, *Gospel of Efficiency*, 2.

[30] Hays, *Gospel of Efficiency*, 3.

Notes to Chapter 1

[1] "The New Oil Works," *Bayonne Herald*, March 10, 1877.
[2] "New Oil Works."
[3] "Bayonne's Industries," *Bayonne Herald*, March 10, 1877.
[4] "New Oil Works."
[5] Gasometers were large containers used for the storage of gaseous chemicals. "New Oil Works."
[6] "New Oil Works."
[7] The La Tourette House is a historic building in nearby Springville, Staten Island and was constructed in 1836. "Struck Oil," *Bayonne Herald*, August 18, 1877.
[8] State Board of Health of New York, *Report on Stench Nuisances from Oil Refineries Near the Kill Van Kull* (Albany, 1883), 6, Folder 3, Box 6, Arthur Hollick Collection, Staten Island Museum.
[9] Kiechle explains that nuisances were defined in the nineteenth century as "a common category of law that reinforced commonsense avoidance of health threats with legal power to remove, abate, or terminate anything that threatened health." She also cites legal historian William J. Novak as asserting that nuisances "unleashed the full power and authority of the state." Melanie Kiechle, *Smell Detectives: An Olfactory History of Nineteenth Century Urban America*, (Seattle: University of Washington Press, 2017), 61.
[10] Examples of secondary literature on New York City's urban environment include Kiechle, *Smell Detectives*; Martin V. Melosi, *Effluent America: Cities, Industry, Energy, and the Environment* (Pittsburgh: University of Pittsburgh Press, 2001); David Stradling, *Smokestacks and Progressives: Environmentalists, Engineers and Air Quality in America, 1881-1951* (Baltimore: Johns Hopkins University Press, 1999); Ted Steinberg, *Gotham Unbound: The Ecological History of Greater New York* (New York: Simon and Schuster, 2014); Joel A. Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron, OH: University of Akron Press, 1996).
[11] Andrew Hurley, "Creating Ecological Wastelands: Oil Pollution in New York City, 1870-1900," *Journal of Urban History* 20, no. 3 (May 1994): 341-3.
[12] Hurley, 347.
[13] Standard Oil did not actually leave Newtown Creek until the mid-1960s.
[14] David Harper, *Roadside Geology of New Jersey* (Missoula, MT: Mountain Press, 2013), 32-40, 61-62; Scott D. Stanford, "Glaciation and Landscape History," in ed. Richard G. Lathrop Jr., *The Highlands: Critical Resources, Treasured Landscapes* (New Brunswick, NJ: Rutgers University Press, 2011), 26-43.
[15] Michael J. Ursin, *Life in and around the Salt Marshes: A Handbook of Plant and Animal Life in and around the Temperate Atlantic Coastal Marshes* (New York: Thomas Y. Cromwell, 1972), xi; Judith S. Weiss and Carol A. Butler, *Salt Marshes: A Natural and Unnatural History* (New Brunswick, NJ: Rutgers University Press, 2009), xiii, 3-5; Richard S. Grumet, *The Munsee Indians: A*

History (Norman, OK: University of Oklahoma Press, 2009), 37; Steinberg, *Gotham Unbound*, 5-8, 12-14.
[16] Michael Chiarappa, "New York City's Oyster Barges: Architecture's Threshold Role along the Urban Waterfront," *Buildings & Landscapes: Journal of the Vernacular Architecture Forum* 14 (Fall 2007): 104-5; John Waldman, *Heartbeats in the Muck: The History, Sea Life, and Environment of New York Harbor* (New York: Lyons Press, 1999), 39-45.
[17] Ursin, *Salt Marshes,* 4, 12.
[18] Steinberg, *Gotham Unbound,* xxiv.
[19] United States Coast Survey, *Map of New-York Bay And Harbor And The Environs* (New York, 1844).
[20] "Constable's Hook" is a far cry from "nip nich sen," the local Native Americans' name for the area. Ernest F. Hoyer, "Yesterday and Today: A Short History of Constable Hook," *Messenger*, December 24, 1920, 2, Box 2.207/K100C, Exxon Mobil Historical Collection (hereafter EMHC), Dolph Briscoe Center for American History, University of Texas at Austin.
[21] "The Oil Works Transferred," *Bayonne Herald*, June 9, 1877; Anthony Wolff, "Going Back with Bayonne," *Lamp* 64, no. 1/2 (Spring/Summer, 1982): 38, Box 2.207/D166, EMHC.
[22] Steinberg, *Gotham Unbound*, 124.
[23] Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (New York: Simon and Schuster, 2008)*,* 56-57.
[24] Steinberg, *Gotham Unbound*, 124.
[25] Ralph W. Hidy and Muriel E. Hidy, *Pioneering in Big Business, 1882-1911: History of Standard Oil Company of New Jersey* (New York: Harper, 1955), 14-23; Hurley, "Creating Ecological Wastelands," 344.
[26] Hurley, "Creating Ecological Wastelands," 346.
[27] Ron Chernow, *Titan: The Life of John D. Rockefeller, Sr.* (New York: Random House, 1998)*,* 218–22.
[28] Yergin, *Prize,* 56.
[29] "Oil Works Transferred"; "The Commerce of Bayonne," *Bayonne Herald*, July 7, 1877.
[30] James G. Speight, *The Refinery of the Future* (Burlington, MA: Elsevier, 2011), 47-8.
[31] "New Oil Works."
[32] State Board of Health of New York, *Report on Stench Nuisances*, 6.
[33] "At the Hook," *Bayonne Herald*, June 8, 1878.
[34] "Bursting of Oil Pipes," *Bayonne Herald*, June 8, 1878.
[35] "Boiler Explosion: Calamity at Constable Hook," *Bayonne Herald,* February 2, 1878.
[36] "At the Hook," *Bayonne Herald*, February 23, 1878.
[37] "Fire Signals," *Bayonne Herald*, October 4, 1879.
[38] "Fire at Bayonneport," *Bayonne Herald*, January 3, 1880.
[39] "Another Standard Fire," *Bayonne Herald*, July 10, 1880.
[40] "Explosion," *Bayonne Herald*, October 16, 1880.

[41] "Explosion."
[42] "Oil Explosion: Another Blaze at the Works of the Standard Oil Company," *Bayonne Herald*, February 19, 1881.
[43] "Another Oil Refinery: How the 'Hook' Section is Building Up," *Bayonne Herald*, December 12, 1880.
[44] "The Newtown Creek Nuisance: What the Board of Health Say on the Subject the Bone-Boiling Business Not Complained Of," *New York Times*, May 5, 1878.
[45] "Hunter's Point Stenches: Final Meeting of the Effluvium Committee," *New York Times*, March 6, 1881.
[46] Kiechle, *Smell Detectives*, 61.
[47] "Pest at Hunter's Point," 538.
[48] "Pest at Hunter's Point," 538; Kiechle, *Smell Detectives*, 220.
[49] Kiechle, *Smell Detectives*, 145, 220.
[50] "How to Stop the Odors: Reports Made by the New-York State Board of Health," *New York Times*, April 17, 1881.
[51] "How to Stop the Odors"
[52] "Pest at Hunter's Point," 538.
[53] "Hunter's Point Stenches."
[54] Workers at oil refineries had dangerous jobs. On December 3, 1921, oil fumes killed Paul H. Wagner, a worker at the Bayway refinery, while he was checking an oil gauge. His colleagues found him with his head and arms inside a manhole on an oil tank at the refinery. "Killed by Fumes Gauging Oil," *Evening World*, December 23, 1921.
[55] "The Pest at Hunter's Point," *Harper's Weekly*, August 6, 1881, 538.
[56] "Pest at Hunter's Point," 530.
[57] "Pest at Hunter's Point," 530.
[58] "Pest at Hunter's Point," 531.
[59] Kiechle, *Smell Detectives*, 218-25.
[60] Thomas Nast, "The Governor and the People of New York Defied," *Harper's Weekly*, August 13, 1881, 545.
[61] Thomas Nast, "Let Us Have a Clean Sweep All Around New York: The Next Task for Hercules Coleman," *Harper's Weekly*, August 20, 1881, 561.
[62] "Smells: Those Arising from Factories on Newtown Creek," *Brooklyn Daily Eagle*, March 5, 1881.
[63] "Smells."
[64] "The Crusade Against Smells," *Brooklyn Daily Eagle*, April 25, 1881.
[65] "The Crusade Against Smells."
[66] "Aromas: The Governor's Proclamation for Their Abatement Still Unheeded—What the Proprietors of the Factory Say," *Brooklyn Daily Eagle*, June 2, 1881.
[67] "The Hunter's Point Nuisance," *Harper's Weekly*, August 13, 1881, 546.
[68] "Stopping a Nuisance," *Bayonne Herald*, June 19, 1880.
[69] "The Pipe War: The Standard's Latest Move—An Injunction," *Bayonne Herald*, October 9, 1880.
[70] New Jersey Board of Health, *Fourth Annual Report of the Board of Health of the State of New Jersey, 1880* (Camden, NJ: Sinnickson Chew, 1881), 21.

[71] New Jersey Board of Health, *Fourth Annual Report*, 21.
[72] New Jersey Board of Health, *Fourth Annual Report*, 23.
[73] Tarr, *The Search of the Ultimate Sink*, 36-76.
[74] New Jersey Board of Health, *Fourth Annual Report*, 23.
[75] New Jersey Board of Health, *Fifth Annual Report of the Board of Health of the State of New Jersey, 1881* (Camden, NJ: Sinnickson Chew, 1882), 23.
[76] New Jersey Board of Health, *Fifth Annual Report*, 23.
[77] New Jersey Board of Health, *Fifth Annual Report*, 23.
[78] "How to Stop the Odors."
[79] "How to Stop the Odors."
[80] State Board of Health of New York, *Stench Nuisances*.
[81] State Board of Health of New York, *Stench Nuisances*.
[82] State Board of Health of New York, *Stench Nuisances*.
[83] State Board of Health of New York, *Stench Nuisances*.
[84] State Board of Health of New York, *Stench Nuisances*.
[85] State Board of Health of New York, *Stench Nuisances*.
[86] State Board of Health of New York, *Stench Nuisances*.
[87] "How to Stop the Odors."
[88] "Saturday, July 10, 1886," *Richmond County Advance,* July 10, 1886.
[89] Stradling, *Smokestacks and Progressives*, 2, 14-15.
[90] "Not a Nuisance: New-Brighton Must Put up with Smoke and Fumes," *New York Times*, December 25, 1892, 20.
[91] "New Oil Works."
[92] "They Smoke…" *Richmond County Advance*, February 4, 1893.
[93] Historian Brian Black has demonstrated that Titusville's refineries changed the region's environment, arguing that places near Oil Creek "led the way for a period in which Americans came to accept increasingly intensive manipulation of their natural surroundings." Brian Black, *Petrolia: The Landscape of America's First Oil Boom* (Baltimore: Johns Hopkins University Press, 2003), 6; "They Smoke…"
[94] "They Smoke…"
[95] "Standard's War on Fire: Lightning's Descent Upon Three Tanks at Once a Surprise," *New York Times*, July 8, 1900, 12; "Oil Fire Still Rages: The Standard's Loss Now Reaches More Than $2,500,000," *New York Times*, July 7, 1900, 14; "Great Oil Works Fire Unabated: Loss Over Two Millions at Constable Hook," *New York Times*, July 6, 1900, 7; "Oil Fire Burns Out: Constancy of the Wind to One Direction Saves the Great Refineries—The Standard's Loss," *New York Times*, July 8, 1900, 12.
[96] North Shore [pseud.], letter to the editor, *New York Times*, August 12, 1900.
[97] Shore, letter to the editor.
[98] New York State Senate, *Report of the New York Bay Pollution Commission to Frank Wayland Higgins, Governor of the State*, *no. 39* (Paterson, NJ: Paterson Chronicle Print, 1905), 6-7.
[99] "New Standard Oil Plant," *New York Times*, January 13, 1908.

[100] "Biggest Oil Plant and 100 More Ships," *New York Times*, December 19, 1907.
[101] "Acreage Deals in Jersey," *New York Times*, March 29, 1908; "Biggest Oil Plant."
[102] "Biggest Oil Plant."
[103] Riparian Rights Commission, *Modification in the Pierhead and Bulkhead Line for Part of the West Shore of Arthur Kill between Piles and Morse Creeks, N.J.* (1908), Maps, New Jersey State Archive.
[104] "Building an Oil Plant in the Wilds," *New York Times*, November 29, 1908.
[105] "Oil Plant in the Wilds"; "Biggest Oil Plant."
[106] Gorman, *Redefining Efficiency*, 94-5; Hurley, "Creating Ecological Wastelands," 348.
[107] "Standard's Best Profits," *Evening Post,* November 25, 1908.
[108] Chiarappa, "Oyster Barges," 89.
[109] "To Protect the Oyster Beds," *New York Times*, May 30, 1886.
[110] "Should Be Stopped," *Richmond County Advance,* December 10, 1887.
[111] Steinberg, *Gotham Unbound*, 128-38.
[112] New York State Senate, *Bay Pollution Commission*, 72.
[113] New York State Senate, *Bay Pollution Commission*, 70-74.
[114] Metropolitan Sewerage Commission of New York, *Digest of Data Collected Before the Year 1908 Relating to the Sanitary Condition of New York Harbor* (New York: Martin B. Brown Press, 1909), 25.
[115] "Saturday, July 10, 1886."
[116] Stradling, *Smokestacks and Progressives*, 2-3.
[117] Stradling, 85-87.
[118] "Standard's Best Profits."

Notes to Chapter 2

[1] "Otto Nobetter and Will Duwright," *Esso Refiner* 21, no. 24 (December 2, 1949): 6.
[2] Joseph Pratt, *Black Waters: Responses to America's First Oil Pollution Crisis* (Houston: American Public Works Association, 2008), 39-43.
[3] Historian Hugh Gorman has argued that between 1925 and 1955, refiners were guided by an ethic of efficiency and waste management that reduced oil refinery pollution, shaped in response to this bill. Hugh S. Gorman, *Redefining Efficiency: Pollution Concerns, Regulatory Mechanisms, and Technological Change in the U.S. Petroleum Industry* (Akron, OH: University of Akron Press, 2001), 1-4, 215-16.
[4] Samuel P. Hays, *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920* (1959; repr., Pittsburgh: University of Pittsburgh Press, 1999), 2-3 & 27.
[5] In the late 1920s, refiners defined conservation as practices that increased efficiency and decreased wastes. Conservation, to them, happened within industry. President Herbert Hoover's Secretary of the Interior, Ray Lyman Wilbur, highlighted the significance of petroleum conservation in a 1929 report.

Secretary Wilbur asserted, "The time has come when conservation of the nation's oil resources must be regarded as a national strategy to be settled by agreement of interests across the table top rather than by conflict thousands of feet underground." At the time, the industry struggled to rein in overproduction and find the right levels of supply to meet demand, hoping that producers could agree to setting levels of production rather than continuing the competition of who could get the oil out of the ground fast enough. Many in the industry were worried about overproducing and straining what they feared was a limited supply of oil underground. Though most of the discussion of conservation within the oil industry revolved around raw resources at extraction sites, by the late 1920s the oil industry also became interested in conservation issues within oil refineries. American Petroleum Institute, *Petroleum Facts and Figures* (Baltimore: Lord Baltimore Press, 1930), 146. R. C. Holmes, "Newspaper and Magazine Editorials and Other Comments of Interest on Conservation of Crude Oil: Taken From Principal Publications in the United States, February 12-April 18, 1929," Box 2.207/G181, Exxon Mobil Historical Collection, Dolph Briscoe Center for American History, University of Texas at Austin (hereafter EMHC).

[6] Hays, *Gospel of Efficiency*, 266.

[7] Gorman, *Redefining Efficiency,* chap. 4.

[8] Gorman, *Redefining Efficiency,* 93.

[9] Department of Conservation and Development, *Industrial Opportunities in New Jersey*, (Trenton, 1924), 9; Joel A. Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron, OH: University of Akron Press, 1996), 55.

[10] Scientists now have a more complex understanding of dissolved oxygen levels. With oxygen less than 55 percent, fish and underwater life begins to decline. Less than 30 percent and the water will become hypoxic, which causes more of a decline in the conditions for life. When no oxygen is found, called anoxia, it is virtually impossible for life that requires oxygen to exist. It is estimated that some areas of New York harbor were hypoxic and anoxic before the 1850s. Ted Steinberg, *Gotham Unbound: The Ecological History of Greater New York* (New York: Simon and Schuster, 2014), 161.

[11] Board of Estimate and Appointment, "Improvement of Sanitary Conditions of New York Harbor," *Journal of Proceedings* (New York, 1926): 7886, microfilm, Vol. 6, Shelf 04760, Reel 123, City Hall Library, New York Public Library; Steinberg, *Gotham Unbound,* 161, 175-77.

[12] Dissolved oxygen levels remained abysmal in New York harbor through 1960. Water oxygen levels finally began to recover due to environmental regulations during the second half of the twentieth century and through technological improvements in sewage treatment upriver. John R. Waldman, *Heartbeats in the Muck: The History, Sea Life, and Environment of New York Harbor* (New York: Lyons Press, 1999), 86-87.

[13] Pratt, *Black Waters*, 10.

[14] Pratt, *Black Waters*, 10; Bureau of Mines, *Pollution by Oil of the Coast Waters of the United States: Preliminary Report* (Washington DC, 1923), 56.

[15] Pratt, *Black Waters*, 10.
[16] "South Beach Plans for Record Season; Many New 'Thrillers' Being Erected," *Staten Island Advance*, March 24, 1920.
[17] "Coast Oil Nuisance to be Eliminated," *Central New Jersey Home News*, August 24, 1920.
[18] "Editorial Mirror: The Oil Nuisance," *Asbury Park Press*, June 28, 1921.
[19] "Coast Oil Nuisance to be Eliminated."
[20] "Editorial Mirror: The Oil Nuisance.".
[21] Pratt, *Black Waters,* 40; "Call Coast Meeting on Surf Pollution," *Asbury Park Press,* Sept. 10, 1920; "Polluting Our Beaches," *Trenton Evening Times*, October 14, 1920.
[22] Pratt, *Black Waters,* 40-41.
[23] "Will Petition Congress to Abate Oil Nuisance," *Asbury Park Press*, August 3, 1921.
[24] "Tell Your Congressman," *Asbury Park Press*, August 4, 1921.
[25] Pratt, *Black Waters*, 13-14.
[26] "Tell Your Congressman."
[27] Pratt, *Black Waters*, 51-52; "Oil Pollution Bill is Passed," *Central New Jersey Home News*, June 7, 1924.
[28] Bureau of Mines, *Pollution by Oil,* 16.
[29] Pratt, *Black Waters*, 50.
[30] Pratt, *Black Waters* 50-51.
[31] Bureau of Mines, *Pollution by Oil*, 38.
[32] Bureau of Mines, *Pollution by Oil*, 39.
[33] Bureau of Mines, *Pollution by Oil*, 40.
[34] F. W. Lane quoted in Pratt, *Black Waters*, 51.
[35] Pratt, *Black Waters*, 51-52.
[36] Bureau of Mines, *Pollution by Oil*, 6.
[37] Bureau of Mines, *Pollution by Oil*, 16.
[38] Bureau of Mines, *Pollution by Oil*, 16.
[39] *Pollution of Navigable Waters: Hearing Before a Subcommittee of the Committee of Commerce United States Senate*, 68th Cong. 1 (1924), 5 (statement of Hon. Joseph Sherman Frelinghuysen, Senate Committee on Commerce).
[40] *Pollution of Navigable Waters*, 7-15 (statement of David M. Neuberger, Senate Committee on Commerce).
[41] *Pollution of Navigable Waters,* 6, (Hon. Frelinghuysen).
[42] *Pollution of Navigable Waters,* 7, (Hon. Frelinghuysen).
[43] *Pollution of Navigable Waters,* 7, (Hon. Frelinghuysen).
[44]*Pollution of Navigable Waters*, 38 (statement of Capt. J. C. Fremont, Senate Committee on Commerce).
[45] *Pollution of Navigable Waters*, 8, (Neuberger).
[46] *Pollution of Navigable Waters*, 29, (Neuberger).
[47] *Pollution of Navigable Waters*, 8, (Neuberger).
[48] *Pollution of Navigable Waters*, 15 (Neuberger).
[49] *Pollution of Navigable Waters*, 15 (Neuberger).

[50] *Pollution of Navigable Waters*, 112-13 (Statement of Mr. Kenneth Allen, Senate Committee on Commerce).
[51] *Pollution of Navigable Waters*, 19-20 (Neuberger).
[52] *Pollution of Navigable Waters*, 21 (Neuberger).
[53] *Pollution of Navigable Waters*, 72 (statement of Mrs. E. A. Linburn, Senate Committee on Commerce).
[54] *Pollution of Navigable Waters*, 74 (statement of Mrs. Clayton D. Lee, Senate Committee on Commerce).
[55] *Pollution of Navigable Waters*, 74 (Lee).
[56] *Pollution of Navigable Waters*, 17 (Neuberger).
[57] *Pollution of Navigable Waters*, 16 (Neuberger).
[58] *Pollution of Navigable Waters*, 111-12 (statement of Mr. H. E. Newell, Senate Committee on Commerce)
[59] *Pollution of Navigable Waters*, 92 (statement of Van H. Manning, Senate Committee on Commerce).
[60] Gorman, *Redefining Efficiency,* 89-117.
[61] *Pollution of Navigable Waters*, 105 (statement of Francis S. McIlheny, Senate Committee on Commerce).
[62] Gorman, *Redefining Efficiency*, 9.
[63] *Pollution of Navigable Waters*, 96 (statement of Robert F. Hand, Senate Committee on Commerce).
[64] *Pollution of Navigable Waters*, 100 (Hand).
[65] *Pollution of Navigable Waters*, 86 (Hand).
[66] Quoted in Gorman, *Redefining Efficiency*, 114; *Pollution of Navigable Waters*, 104-5 (McIlheny).
[67] Quoted in Gorman, *Redefining Efficiency*, 114; *Pollution of Navigable Waters*, 104-5 (McIlheny).
[68] Gorman, *Redefining Efficiency,* 89-117.
[69] Interdepartmental Committee on Oil Pollution of Navigable Waters, *Oil Pollution of Navigable Waters: Report to the Secretary of State by the Interdepartmental Committee* (Washington, DC: Government Printing Office, 1926), 14.
[70] Interdepartmental Committee on Oil Pollution of Navigable Waters, *Oil Pollution of Navigable Waters*, 14-15.
[71] Pratt, *Black Waters,* 67.
[72] *Pollution of Navigable Waters*, 100 (Hand).
[73] "Not Too Late Yet," *Oil and Gas Journal*, February 7, 1929, Box 2.207/G181, EMHC.
[74] Gorman, *Redefining Efficiency*, 215-17.
[75] Gorman, *Redefining Efficiency*, 1-3, chap. 4.
[76] H. Janney Nichols Jr., "Absorption Plant Recovers Gasoline from Fuel Gas," *"Standard" Refiner* 4, no. 3 (March 1932), Box 2.207/D93A, EMHC.
[77] "N.J. Works Anti-Waste Program Planned," *Esso Refiner* 11, no. 9 (June 23, 1939): 1, 5, Box 2.207/D93B, EMHC.
[78] "N.J. Works Anti-Waste Program Planned."

[79] Oil Content of Bayway Refinery Waste Water Effluent, "Harbor Pollution," Box 2.207/G84, EMHC.
[80] William Child to J. P. Warner, May 11, 1956, Minutes of the 26th General Meeting, Refinery Loss Committee, April 16-18, 1956, Box 2.207/G84, EMHC.
[81] Child to Warner.
[82] Child to Warner.
[83] "Organization of Conservation Control Activities," Minutes of the 28th General Meeting, Refinery Loss Committee, April 30-May 2, 1958, 5-3-1, Box 2.207/G84, EMHC.
[84] "Organization of Conservation Control Activities."
[85] "Organization of Conservation Control Activities," 5-3-2.
[86] "Organization of Conservation Control Activities," 5-3-1.
[87] "Organization of Conservation Control Activities," 5-3-2.
[88] "Pollution and Loss Control: Instruments Used to Detect Losses," Oil Conservation Division, Baton Rouge Refinery, January 1959, 5, Box 2.207/G84, EMHC.
[89] Gorman, *Redefining Efficiency*, 215-46.
[90] "Waste Elimination Program in N.J. Works Hits Stride," *Esso Refiner* 11, no. 11 (August 4, 1939): 1-2, Box 2.207/D93B, EMHC.
[91] "Otto Nobetter and Will Duwright," *Esso Refiner* 21, no. 21 (October 21, 1949): 7, Box 2.207/D94C, EMHC.
[92] "Pollution and Loss Control," 9.
[93] "A Summary of the Report 'Survey of Oil Loss Reduction Activities—Standard Oil Company (New Jersey),'" Minutes of the 23rd General Meeting, Refinery Loss Committee, April 8-10, 1953, Box 2.207/G84, EMHC.
[94] Minutes of the 23rd General Meeting, OLP-1-3.
[95] "Summary of the Report," OLP-1-2.
[96] Minutes of the 23rd General Meeting, OLP-1-3.
[97] Minutes of the 23rd General Meeting, OLP-1-5.
[98] "Summary of the Report," OLP-1-3.
[99] "Summary of the Report," OLP-1-3.
[100] I will discuss this in Chapter 4.
[101] "Role of Public Relations," Minutes of the 28th General Meeting, Refinery Loss Committee, April 30-May 2, 1958, 5-7-1, Box 2.207/G84, EMHC.
[102] "Role of Public Relations."
[103] "Role of Public Relations."
[104] "Role of Public Relations."

Notes to Chapter 3

[1] Florence A. Tait to Rockefeller Jr., June 7, 1923, Business Interests—Standard Oil of New York, New Jersey Property, 1923-1942, Folder 1013, Box 136, Series C, Business Interests, FA312, Office of the Messrs. Rockefeller records (hereafter OMR), Rockefeller Archive Center.
[2] Rockefeller Jr. to Tait, June 18, 1923.

[3] Rockefeller Jr. to H. C. Folger, June 18, 1923, Business Interests—Standard Oil of New York, New Jersey Property, 1923-1942, Folder 1013, Box 136, Series C, Business Interests, FA312, OMR.
[4] Rockefeller Jr. to Tait, October 25, 1923.
[5] This legislation is discussed in detail in chap. 2.
[6] As Paul Sabin has argued, historians can trace profits generated by the oil industry to discover changes to the landscape. Paul Sabin, *Crude Politics: The California Oil Market, 1900-1940* (Berkeley: University of California Press, 2005), 10.
[7] See Christopher W. Wells, *Car Country an Environmental History* (Seattle: University of Washington Press, 2012); Christopher F. Jones, *Routes of Power: Energy and Modern America* (Cambridge, MA: Harvard University Press, 2014).
[8] Paul Sabin, "'The Ultimate Environmental Dilemma': Making a Place for Historians in the Climate Change and Energy Debates," *Environmental History* 15 (January 2010): 86-87.
[9] Sabin, "'The Ultimate Environmental Dilemma,'" 85.
[10] Laurance S. Rockefeller, "Palisades Interstate Park," May 8, 1957, Folder 1118, Box 126, Series E, Cultural Interests, FA314, OMR.
[11] David Harper, *Roadside Geology of New Jersey* (Missoula, MT: Mountain Press, 2013), 136-37.
[12] Robert O. Binnewies, *Palisades: 100,000 Acres in 100 Years* (New York: Fordham University Press, 2001), 1, 7-11, 31.
[13] "Saving the Palisades: Ownership and Destruction of the Rocks," *Evening Post*, October 20, 1894.
[14] "Governor Wert's Message: A Plan to Save the Palisades," *Evening Post*, January 8, 1895.
[15] "Defend the Palisades from the Quarrymen," *Evening World*, March 25, 1893.
[16] James P. McQuaide to Rockefeller Jr., March 3, 1902, Palisades Interstate Park—Palisades Park Commission, Folder 1116, Box 125, Series E, Cultural Interests, FA314, OMR.
[17] McQuaide to Rockefeller Jr., March 14, 1902.
[18] Rockefeller Jr. to Lieutenant Governor Timothy L. Woodruff, March 18, 1902, Palisades Interstate Park—Palisades Park Commission, Folder 1116, Box 125, Series E, Cultural Interests, FA314, OMR.
[19] Starr J. Murphy to Woodruff, February 24, 1906, Palisades Interstate Park—Palisades Park Commission, Folder 1116, Box 125, Series E, Cultural Interests, FA314, OMR.
[20] Ted Steinberg, *Down to Earth: Nature's Role in American History*, 2nd ed. (Oxford: Oxford University Press, 2009), 136-154.
[21] "New Jersey: Save the Palisades," *Evening World*, January 8, 1895.
[22] Susan Schrepfer and Douglas Cazaux Sackman, "Gender," in *A Companion to American Environmental History*, ed. Douglas Cazaux Sackman (Malden, MA: Blackwell, 2010), 125-26.
[23] Binnewies, *Palisades,* 7-11.

[24] Historian Polly Kaufman argues that women's interests in creating parks was an extension of their duties as protectors of the home, because both people and wildlife found their home in nature. Schrepfer and Sackman, "Gender," 12; Polly Welts Kaufman, *National Parks and the Woman's Voice: A History*, rev. ed. (Albuquerque: University of New Mexico Press, 2006).
[25] For the first thirty-seven years of its organizational history, the Palisades Interstate Park Commission was technically two groups, one in New Jersey and one in New York, and were collectively known as the Commissioners of the Palisades Interstate Park. In 1937 they were merged into one governing body, the Palisades Interstate Park Commission. The fight with the quarries, though largely over by the end of 1910, continued with several other quarries until 1920 when the Commission was able to buy the last property holding out. "Background of the Palisades Interstate Park Commission," May 8, 1957, Palisades Interstate Park—Palisades Interstate Park Commission—Laurance S. Rockefeller, 1939-1945, Folder 1153, Box 129, Series E, Cultural Interests, FA314, OMR.
[26] *Correspondence between Gov. Hughes, Mrs. E. H. Harriman, and Mr. Geo. W. Perkins, President of the New York Palisades Park Commission with Regard to Plans for Preserving the West Bank of the Hudson River and Establishing a State Park*, Folder 1116, Box 125, Series E, Cultural Interests, FA314, OMR.
[27] Rockefeller Jr. to George Perkins, 1914, Folder 1116, Box 125, Series E, Cultural Interests, FA314, OMR; Binnewies, *Palisades,* 28.
[28] Allan Nevins, *John D. Rockefeller* (New York: Charles Scribner's Sons, 1959), 9.
[29] "Rockefeller Was Pioneer in the Organizing of Vast Private Philanthropy: Chicago School Got $34,708,375," *New York Times*, May 24, 1937; Ron Chernow, *Titan: The Life of John D. Rockefeller, Sr.* (New York: Random House, 1998), 237-42, 301-29.
[30] John Ensor Harr and Peter J. Johnson, *The Rockefeller Century* (New York: Scribner, 1988), 120; Albert F. Schenkel, *The Rich Man and the Kingdom: John D. Rockefeller, Jr., and the Protestant Establishment* (Minneapolis: Fortress Press, 1995), 1, 32; Joseph W. Ernst, ed., *"Dear Father/Dear Son": Correspondence of John D. Rockefeller and John D. Rockefeller, Jr.* (New York: Fordham University Press, 1994).
[31] Joseph W. Ernst, ed., *Worthwhile Places: Correspondence of John D. Rockefeller, Jr. and Horace M. Albright* (New York: Fordham University Press, 1991), 3-20.
[32] Ernst, *Worthwhile Places*, 4.
[33] Figures have not been adjusted for inflation.
[34] Fosdick, Raymond B. Portrait, Research Notebooks, Vols. 22-26, Folder 503, Box 57, Series V, Biographical Works, FA335, OMR.
[35] Binnewies, *Palisades,* 31; Rockefeller Jr. to Gov. B. B. Odell, March 31, 1902, Palisades Interstate Park—Palisades Park Commission 1902-1931, Folder 1116, Box 125, Series E, Cultural Interests, FA314, OMR.
[36] For works that have specifically explored John D. Rockefeller Jr.'s conservationist legacy, see Nancy Newhall, *A Contribution to the Heritage of*

Every American: The Conservation Activities of John D. Rockefeller, Jr. (New York: Knopf, 1957); Ernst, *Worthwhile Places*; Ann Rockefeller Roberts, *Mr. Rockefeller's Roads: the Untold Story of Acadia's Carriage Roads and Their Creator* (Stoughton, ME: Down East Books, 1990).

[37] "Andrews, Samuel," *The Encyclopedia of Cleveland History,* Case Western University and the Western Reserve Historical Society, accessed June 20, 2016, http://ech.case.edu/ech-cgi/article.pl?id=AS6.

[38] In 1911, Rockefeller Sr. owned a quarter of the Standard Oil Company's stock. After the company was broken up into successor companies, he ignored calls to sell the stock at its high prices, betting that the company would be worth more in pieces than as a whole. He was right and as a result his wealth rose significantly. Daniel Yergin, *The Prize: The Epic Quest for Oil, Money, and Power* (New York: Simon and Schuster, 1991), 113.

[39] "Inflation Calculator," US Inflation Calculator (website), accessed February 22, 2018, www.usinflationcalculator.com.

[40] Harr and Johnson, *The Rockefeller Century*, 120; Schenkel, *The Rich Man and the Kingdom,* 1, 32; Ernst, *"Dear Father/Dear Son*."

[41] Memorandum, June 10, 1958, Palisades Interstate Park—1952 Offer, January 1953-1959, Folder 1138, Box 127, Series E, Cultural Interests, FA314, OMR.

[42] A. K. Morgan to Janet M. Warfield, March 30, 1954, Palisades Interstate Park—1952 Offer, Jan. 1953-1959, Folder 1138, Box 127, Series E, Cultural Interests, FA314, OMR.

[43] "Parkway on the Hudson," *Evening Enterprise*, Sept. 21, 1904.

[44] Charles Fay to Murphy, March 22, 1906, Folder 1116, Box 125, Series E, Cultural Interests, FA314, OMR.

[45] *Palisades Park with Proposed Extensions Accompanying the Message of Hon. Charles E. Hughes, Governor*, December 28, 1909, Folder 1116, Box 125, Series E, Cultural Interests, FA314, OMR; Binneweis, *Palisades,* 38-56.

[46] Perkins to Gov. Hughes, Nov. 22, 1909, *Correspondence*.

[47] Gov. Hughes to Perkins, November 23, 1909, *Correspondence*.

[48] "To Build Storm King Highway," *Poughkeepsie Eagle*, July 28, 1914.

[49] Newhall, *Heritage of Every American,* 22.

[50] Palisades Interstate Park Commission, "60 Years of Park Cooperation, 1900-1960," 1960, Palisades Interstate Park—Palisades Interstate Park Commission—Reports and Printed Material, 1940-1960, Folder 1178, Box 133, Series E, Cultural Interests, FA314, OMR.

[51] Lolita L. W. Flockhart, *A Full Life: The Story of Van Dearing Perrine* (Boston: Christopher Publishing, 1939), 220.

[52] Paul Sutter, *Driven Wild: How the Fight against Automobiles Launched the Modern Wilderness Movement* (Seattle: University of Washington Press, 2005), 24-29.

[53] Murphy to Perkins, December 6, 1909, Palisades Interstate Park—Palisades Park Commission, 1902-1931, Folder 1116, Box 125, Series E, Cultural Interests, FA314, OMR.

[54] Perkins to Rockefeller Jr., November 9, 1912, Palisades Interstate Park—Palisades Park Commission, 1902-1931, Folder 1116, Box 125, Series E, Cultural Interests, FA314, OMR.
[55] Sutter, *Driven Wild*, 10.
[56] Sutter, *Driven Wild*, 19-53; Roberts, *Mr. Rockefeller's Roads,* 79-108.
[57] Rockefeller Jr.'s granddaughter, Ann Rockefeller Roberts, argues in *Mr. Rockefeller's Roads* that his work building roads at Acadia (between 1913 and 1940 he guided the construction of fifty-seven miles of horse-drawn carriage roads) qualifies him as a preeminent landscape designer. Roberts, *Mr. Rockefeller's Roads,* 1-7.
[58] Roberts, *Mr. Rockefeller's Roads*, 81.
[59] Sutter, *Driven Wild*, 4.
[60] Donald Worster, *A Passion for Nature: The Life of John Muir* (New York: Oxford University Press, 2008), 437-39.
[61] Roberts, *Mr. Rockefeller's Roads*, 79-80.
[62] Roberts, *Mr. Rockefeller's Roads*, 81.
[63] Roberts, *Mr. Rockefeller's Roads*, 84.
[64] Roberts, *Mr. Rockefeller's Roads*, 91.
[65] Roberts, *Mr. Rockefeller's Roads,* 92.
[66] Regional Plan Association, *Regional Plan of New York and Its Environs: The Graphic Regional Plan, Atlas and Description* (New York, 1929), 277-78; Robert M. Hallet, "The City They Plan," *Christian Science Monitor Weekly*, September 13, 1941; Lawrence M. Orton, "The Plan for the New York Region," *Planning and Civic Comment* 4, no. 1 (January-March 1938): 1-4.
[67] Regional Plan Association, *A Report of Four Years' Progress on the Regional Development of New York and Its Environs, with a Program of Present Needs and Opportunities; From Plan to Reality* (New York, 1933), 128; Thomas Adams, Harold M. Lewis, and Theodore T. McCrosky, *Regional Plan of New York and its Environs,* Vol. 1 (Philadelphia: W. M. F. Fell, 1929), 136.
[68] Mildred Adams, "Magic Backdrop of the City: Again the Question Arises of Developing the Palisades, Playground of the People," *New York Times*, October 1, 1933.
[69] Rockefeller Jr. to the Commissioners of the Palisades Interstate Park, July 7, 1933, Palisades Interstate Park—1933 Gift, 1933-1937, Folder 1126, Box 126, Series E, Cultural Interests, FA314, OMR.
[70] Rockefeller Jr. to the Commissioners.
[71] Loula D. Lasker, "Those Private Palisades," *Survey Graphic XIII*, no. 3 (June 1928): 265-69.
[72] Rockefeller may have known about the Regional Plan Association's plans for parks and parkways before the report was printed in 1929. J. DuPratt White, a long-serving Palisades Park Commissioner, was on the committee for parks and parkways in the Regional Plan Association. Morton C. Tuttle Company Engineers, *Methods of Studying Suburban Real Estate: A Report to John A. Osborne, New York City* (Boston, 1932), Palisades Interstate Park—Palisades Interstate Park Commission—Development Studies 1946-1961, Folder 1177, Box

133, Series E, Cultural Interests, FA314, OMR; Adams, Lewis, and McCrosky, *Regional Plan of New York and its Environs,* Vol. 2; Program of Work for the Association, September 11, 1930, Regional Plan Association—Reports 1920-1931, Folder 333, Box 39, Series 3: Early Office Files, FA015, Russell Sage Foundation Records, Rockefeller Archive Center.

[73] "Background of the Palisades Interstate Park Commission."

[74] Rockefeller Jr. purchased these lands in secret, keeping his identity hidden through a series of shell real estate companies run by an employee. He did this to keep prices down. If locals found out who was buying up the land they would have likely raised their prices. Rockefeller Jr. also worked to keep the land-buying secret from the PIPC, as he did not want the commissioners to be aware of his actions.

[75] George C. Williams to Rockefeller Jr., Palisades Interstate Park—1933 Offer, 1931-1949, Folder 1131, Box 127, Series E, Cultural Interests, FA314, OMR.

[76] Rockefeller Jr. to the Commissioners.

[77] William Cronon, "The Trouble with Wilderness; or, Getting Back to the Wrong Nature," in William Cronon, ed. *Uncommon Ground: Rethinking the Human Place in Nature* (New York: W. W. Norton, 1995), 69-90.

[78] Cronon, "The Trouble with Wilderness," 69-90.

[79] Cronon, "The Trouble with Wilderness," 69-90; Ernst, *Worthwhile Places,* 13.

[80] *Report Re: Palisades Property of John D. Rockefeller, Jr.*, September 16, 1946, Palisades Interstate Park—1933 Gift—Miscellaneous Memoranda, 1931-1949, Folder 1131, Box 127, Series E, Cultural Interests, FA314, OMR; Thomas M. Debevoise to the Commissioners of the Palisades Interstate Park, June 10, 1935, Palisades Interstate Park—1933 Gift—Letter of Gift, 1935-1936, Folder 1128, Box 126, Series E, Cultural Interests, FA314, OMR.

[81] Fosdick, Raymond B. Portrait, Research Notebooks, Vols. 22-26.

[82] Newhall, *Heritage of Every American,* 25.

[83] Chief Engineer Ken Morgan to Laurance S. Rockefeller, February 26, 1943, Palisades Interstate Park—Laurance S. Rockefeller, 1939-1945, Folder 1153, Box 129, Series E, Cultural Interests, FA314, OMR.

[84] Binneweis, *Palisades*, 184.

[85] Marshall as quoted in Sutter, *Driven Wild*, 216.

[86] Sutter, *Driven Wild*, 215-18.

[87] Corliss Lamont, "Save the Palisades—3rd Call," *Survey Graphic* (July 1945): 317-19; Binneweis, *Palisades*, 220.

[88] Binneweis, *Palisades*, 220.

[89] New Jersey Association of Parks and Parkways, "Why," Palisades Interstate Park Commission Archives, Alpine, NJ (hereafter PIPC).

[90] New Jersey Association of Parks and Parkways, "Why."

[91] New Jersey Association of Parks and Parkways, "Why."

[92] Palisades Interstate Park Commission, *Composite Annual Report for the Year 1959: New Jersey—New York*, Palisades Interstate Park—Palisades Interstate Park Commission—Reports and Printed Material, 1940-1960, Folder 1178, Box 133, Series E, Cultural Interests, FA314, OMR.

[93] "The History of Englewood Cliffs," Borough of Englewood Cliffs New Jersey (website), accessed July 28, 2017, http://www.englewoodcliffsnj.org/content/305/385/default.aspx.
[94] At 3:30 pm on August 27, policemen read aloud an injunction to construction crews who were told to immediately stop work. But some crews at the southbound gas station continued to work until they received instructions to stop from Jack Hogan Construction and Maintenance Engineer from Esso and M. P. Duryea at the Palisades Interstate Park. M. P. Duryea, "Gas Stations—N.J. Section," August 28, 1959, Box 201, PIPC; M. P. Duryea to M. D. Davidson, "Re: Two Gas Stations," August 28, 1959, Box 201, PIPC.
[95] M. P. Duryea, "Gas Stations," August 28, 1959, Box 201, PIPC.
[96] Duryea, "Gas Stations—N.J. Section," August 18, 1959, Box 201, PIPC
[97] Palisades Interstate Park Commission, *Composite Annual Report*.

Notes to Chapter 4

[1] J. K. Jamieson, "Energy and the Environment: Striking a Balance," *Lamp* 54, no. 1 (Spring 1972): 1-2.
[2] J. K. Jamieson, "Exxon and the Environment," *Lamp* 56, no. 4 (Winter 1974): 1-2.
[3] Jamieson, "Exxon and the Environment," 2.
[4] Standard Oil of New Jersey officially changed its name to Exxon in 1973. "Leadership in Petrochemicals: The Story of Exxon Chemical Company," special issue, *Chemsphere* (Fourth Quarter 1998): 4-12, Box 2.207/H19a, Exxon Mobil Historical Collection, Dolph Briscoe Center for American History, University of Texas at Austin (hereafter EMHC).
[5] Timothy Mitchell, *Rule of Experts: Egypt, Techno-Politics, Modernity* (Berkeley: University of California Press, 2002), 15.
[6] I discuss SONJ's technical approach to environmental problems in the period between 1920 and 1960 in chap. 2.
[7] Paul H. Giddens, *Standard Oil Company (Indiana): Oil Pioneer of the Middle West* (New York: Appleton-Century-Crofts, 1955), 6-7, 22.
[8] Peter H. Spitz, *Petrochemicals: The Rise of An Industry* (New York: John Wiley and Sons, 1988), 64; James Speight, *The Refinery of the Future* (Burlington, MA: Elsevier, 2011), 40.
[9] Helping to further diversify petroleum research, the trustbusters of 1911 inadvertently encouraged technological innovation at Standard Oil, further increasing the company's practical expertise. After the Supreme Court ordered the break up of the Standard Oil trust in 1911, Standard Oil of New Jersey was left without access to their main research center in Indiana. In response, SONJ set up an engineering laboratory at its Bayway refinery in order to continue using scientific practices to find new applications for petroleum fractions in 1913. The laboratories located at Bayway remained the company's research and technological center for nearly a century. In 1919, the SONJ laboratory at Bayway became the formal central location for SONJ's development department, specifically motivated to find new uses for petroleum products. There, scientists

created the first petrochemical product in 1920. SONJ scientists figured out how to utilize propylene gas (previously burnt off as a waste product) to create isopropyl alcohol for use as a commercial solvent. Isopropyl alcohol was the first petrochemical product, or as they called it at the time "oil-chemical." Isopropyl alcohol demonstrated to refiners the plasticity of petroleum molecules and the potential for new applications of hydrocarbons in the marketplace. At the time, SONJ was also experimenting with products like Nujol a mineral oil laxative, Mistol. a rub that claimed to relieve cold symptoms, and an insect repellent, Flit. SONJ chemists formed the Standard Oil Development Company as the center of laboratory experiments for the company in 1927. "Leadership in Petrochemicals," 4-12; Bennett H. Wall, *Growth in a Changing Environment* (New York: McGraw-Hill, 1988), 170-71,180.

[10] Harold F. Williamson, *The American Petroleum Industry: The Age of Illumination, 1859-1899* (Evanston, IL: Northwestern University Press, 1959), v-ix.

[11] Daniel Yergin, *The Prize: The Epic Quest for Oil, Money, and Power* (New York: Simon and Schuster, 1991), 46.

[12] American Petroleum Institute, *Petroleum: Facts and Figures* (Baltimore: Lord Baltimore Press, 1930), 107.

[13] William Kovarik argues that Thomas Midgley and Charles Kettering worked on developing an alternative fuel that was not based on the use of fossil fuels and their TEL experiments simultaneously. At the time, scientists and the oil industry were preoccupied with the idea that oil reserves would run out and that we would be left without a fuel source. Kettering's lab, run by Midgley, actively tested different types of alcohol and ethanol as substitutions for petroleum fuels in the late 1910s and early 1920s. William J. Kovarik, "The Ethyl Controversy: The News Media and the Public Health Debate Over Leaded Gasoline, 1924-1926" (Unpublished dissertation, University of Maryland, 1993), 77-80; Thomas Midgley, IV, *From Periodic Table to Production: The Biography of Thomas Midgley, Jr.; Inventor of Ethyl Gasoline and Freon Refrigerants* (Corona, CA: Stargazer Publishing, 2001), 25-26.

[14] Spitz, *Petrochemicals*, 101-2.

[15] American Petroleum Institute, *Petroleum,* 90.

[16] Wall, *Changing Environment*, 170-75; Henrietta M. Larson, Evelyn H. Knowlton, and Charles S. Popple, *New Horizons, 1927-1950: History of Standard Oil Company (New Jersey)* (New York: Harper and Row, 1971), 153-59; Spitz, *Petrochemicals*, 96-97.

[17] R. T. Goodwin, "Products from Petroleum: Crude Oil as A Source of Chemical Raw Material and of Chemical Material Substitutes," *Lamp* 7, no. 6 (April 1925): 15, Box 2.207/D161, EMHC.

[18] Goodwin, "Products from Petroleum," 15.

[19] For an exploration of popular knowledge of vitamins, see Rima Apple, *Vitamania: Vitamins in American Culture* (New Brunswick, NJ: Rutgers University Press, 1996).

[20] "Will Your Kids Find Its Picture in Their History Books?" *Lamp* 25, no. 4 (December 1942), back cover, Box 2.207/D163, EMHC.
[21] Between December of 1941 and August of 1945, Allied forces used seven billion barrels of crude oil, with the United States producing 80 percent of it. However, in 1937 the United States produced only 800 barrels of 100-octane gas a day, with production spilt evenly between SONJ and Shell Oil. The mobilization for World War II put a new, magnified focus on the development of petrochemicals and the use of new technologies like catalytic cracking. Pressures on refineries to produce in-demand material—100-octane gasoline, toluene, and synthetic rubber—grew, as the United States' support of allied forces transformed into military involvement in the war. SONJ increased production of petroleum products, built new plants, increased purchase of machinery and equipment, and hired more workers, all in response to defense orders. World War II was a conflict fueled by oil. At a banquet held in honor of Winston Churchill during the heart of the war, Stalin is remembered to have toasted and exclaimed, "This is a war of engines and octanes. I drink to the American auto industry and the American oil industry." Harold L. Ickes, *Fightin' Oil* (New York: Knopf, 1943), 6; Yergin, *Prize,* 382; Standard Oil Company of New Jersey, "Background Data on 100 Octane Gasoline," January 1944, Box 2.207/L12C, EMHC.
[22] Ray Bailey, *Blockbusters from Oil: the Exciting True Story of Synthetic Toluene Secretly Developed Source of the TNT that Blasts Americas Foes* (1944), Box 2.207/L12C, EMHC.
[23] M. J. Rathbone, "The Promise of Petrochemicals," *Lamp* 42, no. 3 (Fall 1960): 1, 2.207/D165, EMHC.
[24] "Each Day Humble Supplies Enough Energy to Melt 7 Tons of Glacier," *Life Magazine*, Feb. 2, 1962, 86, https://books.google.com/books?id=k00EAAAAMBAJ&pg=PA86-IA2#v=onepage&q&f=false.
[25] Timothy Cooper and Anna Green, "The *Torrey Canyon* Disaster, Everyday Life, and the 'Greening' of Britain," *Environmental History* 22, no. 1 (January 2017): 101-26.
[26] Harvey Molotoch, "Oil in Santa Barbara and Power in America," *Sociological Inquiry* 40 (Winter 1970): 132.
[27] Hal K. Rothman, *The Greening of A Nation? Environmentalism in the United States Since 1945* (Fort Worth: Harcourt Brace and Company, 1998), 102.
[28] "Paying the Pollution Bill," *New York Times*, April 13, 1969.
[29] William D. Smith, "In Oil Industry, Troubled Waters Resist Calming: No Political Calm for Oil Companies," *New York Times,* May 18, 1969. Ultimately, however, Stephanie LeMenager argues that, "As an originary incident, the Santa Barbara oil spill also points to the weaknesses of mainstream environmentalism as a movement in the United States. For instance, its attraction to middle-class rhetorics of rights, consumption, and sacrifice forecloses structural critique, and its overinvestment in spectatorship troubles its relationship to action." LeMenager, *Living Oil: Petroleum Culture in the American Century* (New York: Oxford University Press, 2014)*, 24.*

[30] Hugh S. Gorman, *Redefining Efficiency: Pollution Concerns, Regulatory Mechanisms, and Technological Change in the U.S. Petroleum Industry* (Akron, OH: University of Akron Press, 2001), 275; Joseph A. Pratt, "Letting the Grandchildren Do It: Environmental Planning during the Ascent of Oil as a Major Energy Source," *Public Historian* 2, no. 4 (Summer 1980): 51; Chris Warren, *Brush With Death: A Social History of Lead Poisoning* (Baltimore: John Hopkins Press, 2001), 203-23.
[31] Warren, *Brush With Death*, 204.
[32] Gorman, *Redefining Efficiency*, 270-71.
[33] "Control of Oil Pollution," *New York Times,* May 15, 1967.
[34] "Control of Oil Pollution."
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