Community Environmental Policing: Assessing New Strategies of Public Participation in Environmental Regulation

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> Impacted communities are ideally located to perform testing due to their proximity and experience. This is similar to community policing. You give people tools and training that are in high crime areas because the cops can't be there all the time. Why not do the same for environmental crimes? The agencies that do respond to complaints often get there too late to take a viable, accurate sample, but the community is already there.... Also it involves and empowers people who would be left out of the process and made bitter, instead you involve them in a meaningful, positive way.
>
> —Denny Larson, Refinery Reform Campaign

Abstract

This paper evaluates a new form of public participation in environmental monitoring and regulation advanced through local "bucket brigades," which allow community members to sample air emissions near industrial facilities. These brigades represent a new form of community environmental policing, in which residents participate in collecting, analyzing, and deploying environmental information, and more importantly, in an array of public policy dialogues. Use of this sampling technology has had marked effects on local residents' perceptions and participation in emergency response and citizens' right-to-know. However, when viewed through the lens of the more developed literature on community policing, the bucket brigades are currently limited in their ability to encourage "co-production" of environmental protection between citizens and the state. Means are examined to strengthen the bucket brigades and to more broadly support community participation in environmental regulation. © 2003 by the Association for Public Policy Analysis and Management.

INTRODUCTION

It is now generally accepted that citizen participation in issues such as public safety,

Manuscript received March 2002; out for review April 2002; pending revision July 2002; revision complete October 2002; revision review October 2002; review complete January 2003; accepted January 2003.

Journal of Policy Analysis and Management, Vol. 22, No. 3, 383–414 (2003)

Published by Wiley Periodicals, Inc. Published online in Wiley InterScience (www.interscience.wiley.com)
DOI: 10.1002/pam.10138

Shepherd and Bowler, 1997; Spyke, 1999). At the same time, including community members in technical decisionmaking or environmental enforcement raises a number of concerns. Local residents often lack training, hold "non-scientific" risk perceptions, shift their focus from crisis to crisis, and lack the time, energy, and commitment to participate meaningfully in long-term environmental issues (Chess, 2000).

In spite of questions raised, public participation is now being called upon to address shortcomings in the traditional state-centric, "command-and-control" environmental regulatory apparatus (NAPA, 2000; Rondinelli, 2000). Critics point out the declining returns and increasing costs of environmental monitoring and enforcement strategies developed in the 1970s (Fiorino, 1995, 2000; Kraft and Vig, 2000; Sexton et al., 1999). Budget constraints, limits on the omniscience of the state, and a growing diversity of environmental hazards prompt analysts and practitioners to question the potential of traditional agency strategies to motivate continued pollution reduction (Karkkainen, 2001; Stewart, 2001).

One area of environmental protection that has received heightened scrutiny is air quality monitoring. Contrary to public impressions, surveillance of most sources of toxic air pollutants is extremely low (Russell, 1983, 1990; Russell, Harrington, and Vaughan, 1986; USEPA, 1981). While self-monitored emissions data are reported by industry, the accuracy and coverage of these data are often questioned (Felleman, 1997). State monitoring efforts, which focus on the use of fixed ambient monitors, are also limited in their ability to provide detailed, accurate information to the public. The location, range, and focus of ambient monitors are determined through an inherently political process. Agency resource limitations add to the sporadic placement of monitoring stations that are not optimally suited for assessing the impact of pollutant concentrations across residential areas (NSTC, 1997; Walker, 1997). Critics believe that the limits of current monitoring systems perpetuate an environment in which firms pollute beyond safe levels, and with little threat of punishment. When violations of air permits are discovered, the most common response is for an agency to issue a "notice of violation," ordering a return to compliance without further action (Russell, 1990). Most state agencies issue penalties for fewer than 5 percent of notice of violationspublic. li;aRT/w

As criticism of the nation's multi-billion dollar monitoring and enforcement system mounts (Kraft, 1999) and civic engagement is evoked as a possible solution, parallels emerge with the crisis of crime prevention of the late 1960s (Crank, 1994). The nation's system for monitoring ambient air quality standards, enacted by the 1970 Clean Air Act Amendments (42 U.S.C.A. §7401 *et seq.*), is based on government inspectors who follow strict criteria spelled out in permits S wYYp to point source polluters. Similarly, policing was built around a paramilitary structure designed to move orders down a chain of command to officers ready to respond to 911 calls (Skogan and Hartnett, 1997). Traditional policing began to suffer a crisis of legitimacy as the 1964 and 1968 presidential elections drew attention to perceptions of sharp crime increases across the country (Walker, 1980). High-profile

semi-structured interviews (n = 25) with citizen groups, local residents, agency officials, and industry representatives. Also analyzed were EPA, Louisiana Department of Environmental Quality (DEQ), and Bay Area Air Quality Management District (BAAQMD) records of complaints, government inspections, and pollution episodes related to the five case study facilities. An evaluation of media reports and citizen group documents regarding the cases complemented this analysis. By combining analysis of quantitative government data with qualitative interview data and public records, evidence on the implementation and impacts of the bucket brigades was effectively "triangulated." Conclusions drawn from interview data were evaluated and cross-referenced with quantitative data and public records. (For a fuller description of methods, see Appendix A.) Obtaining data from different sources allowed evaluation of how processes of gathering and interpreting

policing priorities, shifting focus to "broken windows"[4] and "public order" rather than just emergencies and illegal incidents (Kelling, 1987; Wilson and Kelling, 1982, 1989). This in turn helps shift police strategies from "incident-oriented" to "problem-oriented" policing (Goldstein, 1990; Skogan and Hartnett, 1997). Community participation in neighborhood watch programs can provide new sources of information for identifying problems and their root causes (Crank, 1994; Friedman, 1995; Rosenbaum, 1987) and help to "co-produce" policing through the combined actions of community members and police agencies (Fung, 2001; Schneider, 1987). Finally, some versions of community policing focus explicitly on advancing increased accountability over the police (Fung, 2001, Sparrow, Moore, and Kennedy, 1990).

Community policing has of course taken many forms and achieved varying results (Greene and Mastrofski, 1988). Common characteristics of "successful" community policing initiatives have included: a move toward organizational decentralization, better communication between the police and the public, new kinds of information exchange, increased responsiveness to citizen concerns, increased trust and coordinated actions, efforts to understand the causes of problems, analyzing patterns of problems ("hot spots"), and responding creatively to these problems through multiple means and coordination with other agencies (Lavrakas, 1995; Rosenbaum, 1987; Skogan and Hartnett, 1997; Wilson and Kelling, 1989).

Analysts have also pointed to the challenges and limitations of broader public participation in crime fighting. First, there continues to be extensive police resistance to changing strategies of policing (Sparrow, Moore, and Kennedy, 1990). Some police do not believe that "lay" community members can provide valuable information. Many versions of community policing have thus had a limited substantive role for the community. As Buerger (1994, p. 416) notes, "community policing, by and large, remains a unilateral action on the part of the police." Of the standard community partnership roles advanced by community policing—citizen as "eyes and ears" of the police, cheerleader, provider of monetary resources, and maker of public statements to criminal elements—only the last goes beyond mere legitimization of police actions. Yet, even community-based statements to criminal behavior tend to be directed toward "respectable" actors (such as landlords and local political officials), which are prone to the effects of moral suasion.

In cases where there is a role for the community, residents are often reluctant to spend their time and energy, and to risk retribution, for participating in crime-fighting initiatives (Rosenbaum, 1987). Even organized community members can gradually become demobilized after successes or failures. Research shows that communities most burdened by the lack of a safe environment—the poor and disadvantaged—are often the hardest to keep mobilized (Buerger, 1994). Indeed, early experience with neighborhood watch programs suggests a number of barriers to effective participation in block watch meetings, relating to socioeconomic background and group dynamics (Rosenbaum, 1987). Analysts have thus pointed

effects of industrial activity on low-income communities of color, which receive an inequitable distribution of environmental hazards (Bullard, 1994; Faber, 1998; Hofrichter, 1993; *National Law Journal,* 1992; Thornton, 2000).

about donating bucket samplers to local residents. Larson then set out to simplify and reduce the cost of the buckets, refining the equipment and developing a manual to show community members how to build their own samplers and deploy them through "bucket brigades." The first brigades were formed in Contra Costa County, California, in 1996 to take grab samples of emissions from oil refineries in the county. The buckets were deployed during non-standard conditions, such as accidents, fires, leaks, and explosions. In 1998, the bucket brigades spread to the "Cancer Alley" region of Louisiana to communities affected by refineries and petrochemical plants in Calcasieu and St. Charles parishes. The bucket brigades have since spread to communities in Texas, North and South Carolina, Illinois, Pennsylvania, Ohio, Oregon, Washington, Wyoming, Montana, Tennessee, Georgia, Minnesota, Alaska, St. Croix, South Africa, Swaziland, and Mozambique. By the fall of 2002, 47 bucket brigades were in operation in the United States and

"Coordinators" are responsible for collecting sampling bags after an incident, checking that the proper sampling protocol was followed (including quality assurance and quality control procedures) and sending the bags (which must be delivered within 24 hours) to a labora-

- Holding agencies and polluting firms accountable for their impacts on communities and pressuring them to monitor and enforce more effectively and to reduce pollution; and
- Forcing a new dialogue among industry, government, and community members on pollution issues.

Table 1. Case study firms.

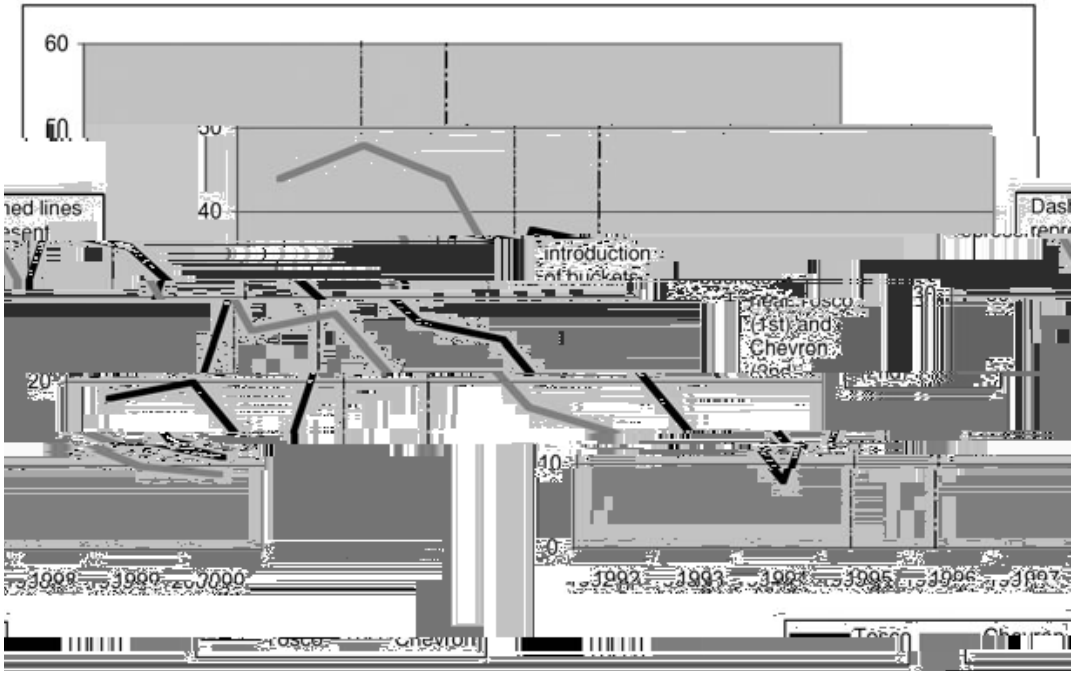
Charles, and Richmond and Rodeo in Contra Costa host hundreds of acres of petrochemical plant operations. People live in areas along the fencelines of these facilities that would have been designated buffer zones under present zoning regulations (Bell, 1995, 1997).[10] The research discussed below focuses on five petrochemical facilities in four towns in two states, as shown in Table 1.

Community members face both major events and ongoing low-level nuisances from these facilities. The California refineries—Chevron and Tosco–Rodeo—have experienced repeated fires, explosions, and releases over the last decade. Also, of any refinery studied nationwide, the Chevron refinery was cited in 1999 for having the highest fugitive emissions from leaks—reportedly, more than 10 percent of its valves leaked (Simon and Anderson, 1999). The communities in Louisiana face similar events and ongoing hazards. Community members recall an explosion of an ethylene pipeline from Shell Chemical in 1973 that killed a young boy and an elderly woman. A second explosion in 1988, of a catalytic cracker[11] at the Shell refinery, resulted in the death of seven workers and the destruction of millions of dollars in property (*Times-Picayune,* 1993, p. A1). In addition to these major events, numerous episodes of flares,[12] leaks, fires, tank car derailments, and other unintended consequences of production have occurred over the last 10 years. Shell Chemical alone has more than 200,000 emission points. Failure to check these points adequately at the Shell Norco complex has been extensively documented (Louisiana DEQ, 2001b, 2001c). Figures 2 and 3 illustrate episodes at facilities in the two counties.

[10] A 1981 parish zoning ordinance in St. Charles prohibits heavy industrial plants from locating within 2000 feet of a residential area. As one local official explained, "Those four streets [next to Shell Chemical] would create a quarter of a mile buffer zone which is not uncommon for industrial facilities...For the grain elevators now in the Parish we've got a 1-mile buffer zone such that you can't build a grain elevator in the Parish anymore because you can't get a 1-mile buffer zone anywhere." Residents of these grandfathered zones live as close as 12 feet to the fenceline of facilities such as Shell Chemical (approximate distance determined during a field visit on April 15, 2001).

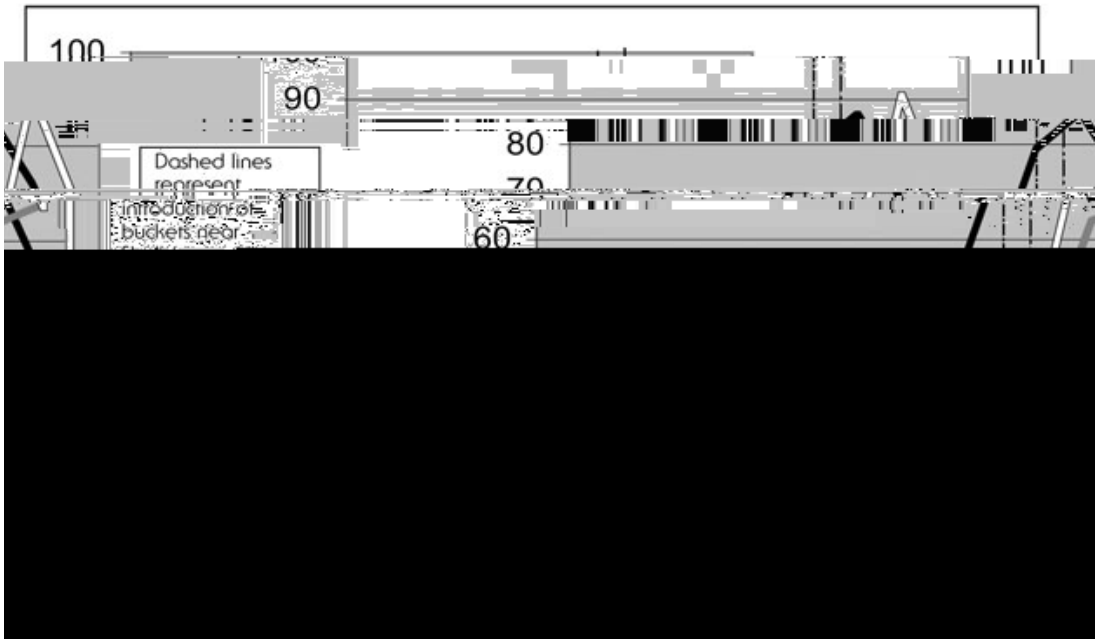
[11] A cracker is a high-pressure and heat unit used to break down molecules to form a variety of chemical products from crude oil.

[12] From 1996 to 1998, 10 documented flares released more than 25 tons of sulfur dioxide (among other pollutants) into the surrounding air (Biers, 2000). These flares focused residents' attention on the potential release of toxic pollutants; the flares are often used when there is too much gas to be burned in boilers and furnaces because of a buildup, a malfunction, or an emergency such as a shutdown or the loss of electricity. Examples of these reported causes of flaring include boiler malfunction, the burning of products that fail to meet specifications, such as ethylene, and mechanical failure causing a unit to be taken off line. "Blazing," or heavy flaring has resulted at the Shell Norco facilities because excess materials have accumulated as a result of mechanical error, or the restarting of olefins units. Shell Norco refers to flaring as a "sign of a productive, industrial community" (Motiva Enterprises LLC, 1999). Flares underscore the tension between industry efforts to avoid cutting back production rates, and concerns that flaring fails to convert all of the chemicals into non-hazardous compounds. An entire Web site, funded by the Sierra Club Legal Defense Fund, has been established to track incidents of flaring in Norco and New Sarpy (Concerned Citizens of Norco et al., 2001).



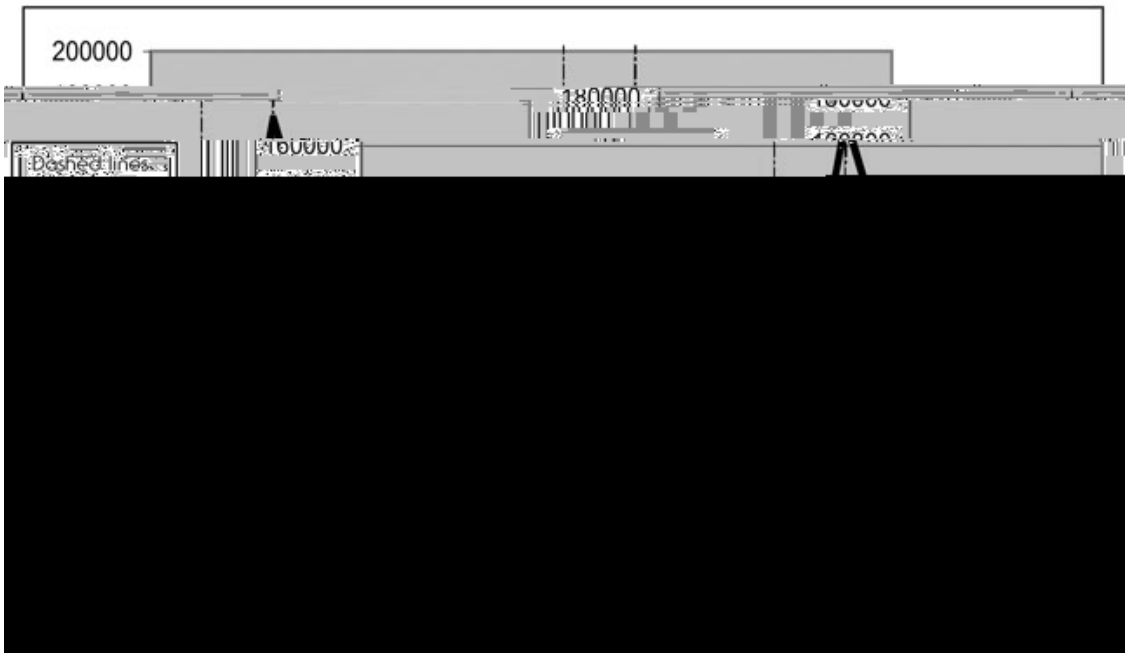
The trend line labeled "Tosco" represents the Rodeo refinery, which was operated by Unocal until April 1, 1997.
Source: Bay Area Air Quality Management District (personal communication, July 2001).

Figure 2. Annual episodes by facility in Contra Costa, 1992–2000.



2001 estimate based on episodes through August 22, 2001.
Source: Louisiana Department of Environmental Quality (personal communication, August 2001.

Figure 3. Annual episodes by facility in Saint Charles, 1988–2001.



Source: Bay Area Air Quality Management District (personal communication, July 2001).

Figure 5. Penalties resulting from BAAQMD enforcement actions, 1988–2000.

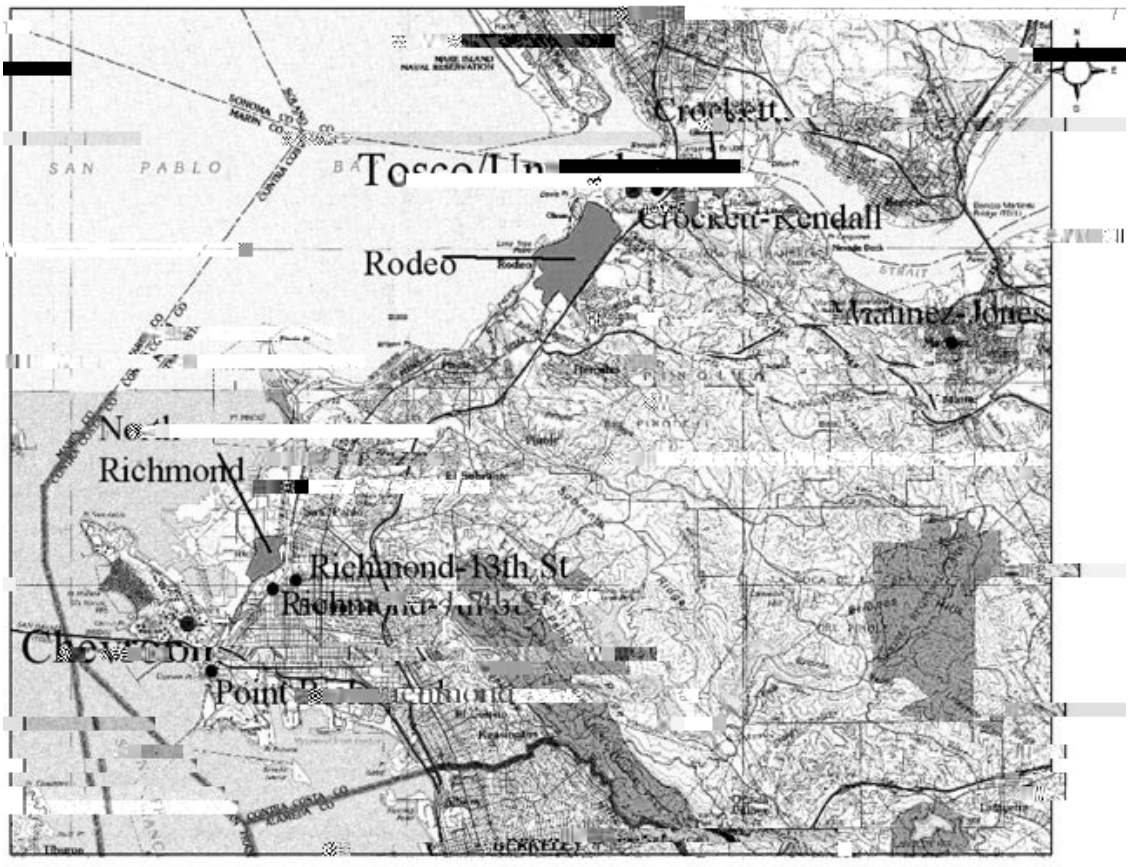
A key concern of community members is that government agencies are not monitoring the full range of chemicals they are exposed to. Existing ambient monitors measure only a handful of criteria air pollutants (those in relative proximity to the case study facilities measure sulfur dioxide [SO_2], carbon monoxide [CO], nitrous dioxide [NO_2], ozone [O_3], particulate matter of 10 microns [PM10], and lead [Pb]) (California Air Resources Board, 2001). Ground-level air monitors required by the District add only a few other compounds, such as hydrogen sulfide (H_2S). By 1997, Saint Charles Parish had established three ambient-air monitoring sites to measure air pollutant concentrations (Louisiana DEQ, 2001a). These monitors were located significant distances (over 30 kilometers in one case) from the facilities of concern to community members and measured a limited range of pollutants (particulate matter, total suspended particulates, and ozone)—not the hundreds of toxic chemicals released every year from petrochemical facilities. Hence, after an incident, community representatives are referred to a monitoring station often kilometers away where monitors almost always record acceptable concentrations of air pollutants. See Figures 6 and 7 for the relative location of industrial sources of pollution, residents, and air monitoring stations. Note that no fixed air monitoring capacity currently exists in the fenceline communities of North Richmond and Rodeo, California, or Diamond, Louisiana.

Impacts of the Bucket Brigades

Following their introduction, the bucket samplers directly and indirectly influenced a variety of citizen, agency, and firm responses. A survey of administrative, industry, and community-level dynamics after the initial use of bucket samplers shows

the following broad trends, attesting to the complexity of evaluating the effects of monitoring with this novel technology:

1. The most universal effects of the use of bucket samplers were changes in residents' understandings and perceptions of pollution, and in community responses at the local level;
2. Administrative actions, some arguably influenced by the use of bucket samplers, were carried out beyond the scope of local decisionmaking;
3. Industrial process changes were implemented, mostly in Contra Costa County, although without direct citizen participation or input;
4. The number of episodes of fire, explosion, or other accidental release remained high or increased at four of the five facilities for the first 12-month period following initial use of bucket samplers. (Chevron, with a significant



Centroid locations for each facility are represented by circles. Air monitors include Crockett–Kendall, Martinez–Jones Street, Point Richmond, Richmond–7th Street, and Richmond–13th Street.

Source: United States Geological Survey Aerial and Topographic Data (Terraserver, 2002; BAAQMD, 2002; Jim Tomich, BAAQMD Supervising Engineer, personal communication, December 20, 2001).

Figure 6. Relative location of facilities, affected communities, and air monitors in Contra Costa communities.

immediate reduction, is the exception.) Thereafter, reductions in the number of episodes were noted at both Contra Costa facilities, while episodes decreased at Motiva and increased at Shell Chemical and Orion in St. Charles;
5. Increased industry monitoring on-site was identified for three of the five facilities;
6. The modal response of petrochemical firms to accidental releases changed little;

In St. Charles, a more focused campaign for relocation and limited agency cooperation have reduced opportunities for changing the relationship between residents and industry representatives. When Shell Chemical and Motiva Enterprises met with residents of the Diamond community for the first time (November 29, 1999), it was to discuss a Voluntary Fenceline Property Purchase Program for residents of the two streets directly adjacent to each plant (Swerczek, 1999). In May 2001, 30 meetings later, only two properties had been sold, while 11 others had agreed to sell (Swerczek, 2001a).[13] Other communications efforts were begun at the suggestion of a report to the National Petrochemical and Refiners Association following the December 8, 1998, incident. A Community Industrial Panel was formed in August 1999 to address community concerns (Thomas, Baker, and Menard, 1999). Shell Chemical, Motiva, and Orion are represented on the panel that also includes area residents, ministers, and other facility managers. A Good Neighbor Initiative, introduced by Shell Chemical and Motiva in September 2000, promises: to reduce emissions by 30 percent and flaring by 50 percent over 3 years; to provide job training to local residents; to establish an air quality monitoring system; and to establish an endowment for community improvements (Swerczek, 2000, 2001b, 2001c). To date, only the endowment has been implemented.

Nonetheless, participation has led to significantly increased awareness about chemicals, health hazards, and monitoring procedures in communities surrounding each facility. Over and over, bucket brigade members explained in technical detail their concerns about industrial practices and emissions of chemical compounds.

State Responsiveness

The factors driving federal and state environmental agency actions regarding St. Charles and Contra Costa facilities are difficult to discern given lack of information on the linkages among citizen complaints, inspections, outside events, and internal discretionary acts within the agencies. Here we focus on St. Charles, where more detailed information is available. Use of bucket samplers in St. Charles may have contributed to the degree and scope of agency actions following their introduction on December 8, 1998, but it would be premature to declare that they were a driving force behind these efforts. The first significant enforcement action taken against Shell Chemical since 1990 included a penalty assessment on November 24, 1998, before the bucket brigade began (Louisiana DEQ, 1998, 2001d).

Motiva also underwent heightened scrutiny starting on July 19, 1999, when DEQ inspected the site and reviewed documents, in conjunction with the EPA Region VI's Multimedia Inspection Team (Louisiana DEQ, 2001e). A compliance order in March 2000 based on the 1999 inspection did not indicate any violations of air quality standards, but focused rather on operation and maintenance deficiencies that resulted in improper handling and treatment of wastewater (Louisiana DEQ, 2000). By the time of their issuance of a Notice of Potential Penalty to Motiva on June 2, 2000, the DEQ and EPA had discovered hundreds of violations, mostly pertaining to open-ended valves and other fugitive emissions, which had been a major focus of

Table 2. Trends following introduction of bucket samplers near targeted facilities.

Facility	Bucket Intro	Ave. Penalties Assessed ($)	Ave. Episodes	Industry Actions	Impacts on Residents/Citizen Groups
Unocal-Tosco	Aug. 1995	8,775 12,467 27,513 82,047 123,374 105,397	na 17 25 47 42.5 38.7	Increased self-monitoring Adjusted operation of plant aerators Installed fenceline monitoring system	Complaints increased and then dropped sharply Supported good neighbor agreement with Unocal Increased awareness and knowledge of emissions Attend pollution monitoring meetings with local, regional officials
Chevron	Nov. 1996	25,639 18,629 28,825 34,180 31,461 53 PFD	38 36.3 31 18 15.5 13.7	Increased self-monitoring Reduced flaring Installed new coker Improved community siren system Shut down fertilizer plant within facility	Complaints stagnant Improve position on community advisory panel Increased awareness and knowledge of emissions Attend pollution monitoring meetings with local, regional officials
Shell Chemical	Dec. 1998	66,500 110,833 330,000 73,458 36,729 24,486	15.4 16.7 25 51 71 69.7	Community/Industrial Panel Good Neighbor Initiative Voluntary Fenceline Purchase Program	Renewed calls for buyout and use of data to support relocation campaign; Diamond Options Program agreed to after facilitated negotiations in June 2002; includes a Property Purchase Component available to all residents of Diamond Increased awareness and knowledge of emissions Challenge industry explanations of recurrent episodes

(Continued on next page)

Table 2. Continued.

Facility	Bucket Intro	Ave. Penalties Assessed ($)	Ave. Episodes	Industry Actions	Impacts on Residents/Citizen Groups
Motiva	June	1000	50.6	Community/Industrial	Calls for buyout and use
	1999	0	62.3	Panel	of data to support
		0	84		campaign
		0	80	Good Neighbor	
		250,000	71	Initiative	Influenced kinds of
		na	na		Beneficial
				Voluntary Fenceline	Environmental Projects
				Purchase Program	required
					Increased awareness and
					knowledge of emissions
Orion	July	closed	closed	Agreed to conduct	Calls for buyout and use
	1999	closed	closed	canister air sampling	of data to support
		0	21	on property	campaign
		5050	39		
		2025	63.5		Expanded scope of
		pending	na		DEQ/EPA investigation
					to include Orion site
					Increased awareness and
					knowledge of emissions

Annual penalty and episode averages are: 5 years prior/3 years prior/12 months prior/12 months after/2 years after/3 years after the initial use of bucket samplers.
PFD = number of violations pending final disposition.
NA = sufficient data not available.
Pending = investigation ongoing.

that this cycle of attention can be attributed to finding a "critical mass" of violations through annual inspections of major facilities:

> We can take a look and say right now we've got some critical mass down in this area, let's go ahead and concentrate on that. We have a number of ways that we look at things. You can't focus on everything, but we do annual inspections of the major facilities. If we find a pattern of something going on, one of the things that came into play down in that part of Louisiana was looking at ambient air models or looking at water discharges into the Mississippi. We have certain things that we have prioritized for that period of time, and as soon as we get that under control, we have another item to go after.

These cycles of activity can either be influenced by or supercede the operation of bucket brigades around facilities of interest.

While EPA Region IX has supported the buckets through grant money and hopes to begin comparative studies of their reliability vis-à-vis approved monitoring techniques, both state and federal agencies assert that the buckets cannot serve as a direct enforcement mechanism (EPA official, personal communication, July 3, 2001; Louisiana DEQ

This increase in monitoring is important because one of the key concerns of community members and environmental groups is the overall lack of monitoring of emissions from these facilities. Motivating firms to carry out their own monitoring has the potential of producing more information for the public and public agencies to use, and providing refinery managers with information on problems stemming from their production processes. Indeed, the bucket brigades—and associated community pressures—have motivated a range of production changes to reduce pollution. One bucket brigade participant (May 23, 2001) argued that bucket sample data has forced Tosco to adjust the operation of plant aerators. Another (May 21, 2001) noted that Chevron had reduced its flaring, installed a new coker, improved a community siren system, and shut down a fertilizer plant within their facility. The mere presence of a bucket brigade is believed to create an incentive for firms to avoid further incidents.

Residents of Norco and New Sarpy in St. Charles are unaware of any internal production process changes at neighboring facilities, although they have observed shifts in flaring cycles, an increase in nighttime emissions, and a reduction in odors during the day. Efforts are being made to adjust the bucket brigade organizations to accommodate these changes and maintain their citizen policing capabilities. As noted in Table 2, episodes have increased dramatically at Shell Chemical since the first sample was taken in December 1998 (with similar increases at the Orion facility), while limited reductions were noted at the Motiva refinery. The growing number of episodes at Orion can be attributed to the refinery's approaching full production after reopening in April 1999, while episode reductions at Motiva coincide with heightened EPA scrutiny that led to a site inspection in July 1999. The only clear link between bucket sampler use and episode trends in St. Charles can be found at Shell Chemical, where a dramatic rise in episodes can be attributed to increased industry reporting encouraged by penalty assessments in November 1998, citizen monitoring, or a combination of the two. Estimates for 2001 suggest that for the first time, episodes declined at each facility.

Data generated from the bucket brigades also appear to have motivated additional monitoring on the part of local agencies and firms (Denny Larson, personal communication, May 21, 2001).

> Agencies like the Bay Area Air District, and the state agencies that are hostile have been forced to take more samples during accidental releases and events, to do more monitoring around facilities.... In the past, there was almost never any air sampling during or after a chemical accident or release. Now, you have community people taking samples, you have Contra Costa County using glass-lined canisters and buckets. You have the Air District out there, taking hand-held and glass-lined canister samples, you've got people tripping all over each other taking samples.... So, it's increased the level of monitoring that's done.

Government agencies appear to feel pressure to be more accountable to affected communities now that data on industrial emissions are public. The BAAQMD, for instance, is developing and expanding its own mobile monitoring program, having retrofitted a van with new mobile monitoring technologies. As one county official (May 24, 2001) admitted, "The fact is that outside groups were implying that they weren't getting their money's worth with the government agency or agencies. It's a democracy. It's a watchdog. Why not? Why not keep government agencies on as well as industry?"

Assessing the Bucket Brigades

How do the bucket brigades perform along key dimensions of public participation and the more specific goals of community policing, such as increasing community

years of community policing, when there was significant pressure on police departments to strip layers from their rank structures and devolve discretion to patrol officers. This led to resistance from supervisors, who sought to maintain an illusion of control even as beat officers were called upon to exercise a growing amount of discretion while making their daily patrols. To date, the majority of state agencies and federal regulators operating in the case study regions—the police for environmental issues—remain unsupportive of community environmental policing.

Reacting partly to these state responses, different bucket brigade organizations are moving forward in different ways. As with community policing, there are both partnership- and accountability-focused versions of community participation. For instance, the BAAQMD, one of the most stringent command-and-control agencies in the country, levied a significant number of violations for a range of facility-specific problems throughout the life of the bucket brigades. Their recognition of problems relating to fugitive emissions, monitoring maintenance problems, flaring, and excess VOCs at the plants provided justification for resident efforts to link their analytic data to proposed problem solutions. Agency actions as well as various court cases resulted in sharp reductions in the number of episodes per year following the introduction of the buckets. In St. Charles, the parish government had minimal discretion in meeting the challenges posed by its refineries. Episodes increased, further legitimating calls for relocation as residents saw little government sanctioning of efforts to link root causes of facility incidents to additional uses of bucket data or other solutions (see Figure 3). Community groups have applied the bucket brigades differently in response to these varied contexts.

Thus, while even some of the earlier, unilateral efforts of police departments to involve the public have not yet occurred in the arena of environmental monitoring, the bucket brigades hold the potential to involve a more expansive and direct form of citizen action than community policing. Bucket brigades focus directly on tracking and changing “criminal” behavior. They seek processes through which to negotiate directly with those causing local nuisances or emissions (a strategy specifically discouraged in community policing). And they have pushed strategies that provide direct access to the courts in order to speed remediation. The bucket brigades also show that “weak” communities can respond to environmental problems and effec-

community policing. Indeed, our research identified a number of community organizing challenges experienced by the bucket brigades, which can be easily overlooked in reports of early successes. These included problems with sampling protocols, training of local samplers, mobilizing community members to participate in sampling and technical debates, and strengthening community capacity to analyze and interpret sample results.

The progression from pilot projects to broader implementation in some ways mirrors the development of community policing infrastructure. In the case of air quality monitoring, this requires adequate attention to how co-production of environmental protection can occur between the state and the public, given the limitations and opportunities posed by the bucket brigades.

TOWARD COMMUNITY ENVIRONMENTAL POLICING

A number of participants in the bucket brigades, including some of the original leaders, believe that bucket data should support litigation efforts against targeted facilities. The original idea for the buckets was to gather data for lawsuits and to support legal remedies for emissions violations. Despite the development of legally oriented protocols for tracking the chain of custody of monitoring samples and laboratory handling, the bucket data have still not been admitted into evidence or used to adjudicate a court case. From agency staff to activists, a number of people were skeptical that the bucket data could ever withstand the court's scrutiny. Advocates, however, believe that with the right quality assurance, training, and sampling procedures, bucket data could gain the status of legal evidence.

Others see the future of the buckets as an advanced and more technical form of citizen complaints. Bucket data in this model would be used more extensively in motivating enforcement actions. Community participation would serve primarily to provide information and incentives for the state to enforce environmental regulations more stringently, akin to the "eyes and ears" function of early neighborhood watch programs. In this view, the bucket brigades offer an additional weapon in tra-

brigades are reliant on human capital for setup, maintenance, and usage. This system has not encouraged more specific avenues for exploring the sources contributing to accidental releases, excessive flaring of refinery catalysts or impurities, or other symptoms of disorder that plague fenceline communities. Similarly, early efforts to improve the efficiency of 911 call response ignored the discovery of situations that produce calls for police assistance in the first place. This kind of joint exploration of root causes and new methods for addressing them has not occurred, in large part due to the inability of the bucket brigades to encourage co-production with state and federal agencies.

To get a sense of the possibilities for community involvement in environmental monitoring, we must tease apart the avenues of co-production that can result in communities helping to resolve crimes on their own, and the kinds of problem-solving that co-production can encourage. Two forms of co-production, joint and parallel, are discussed in the community policing literature (Percy, 1984). The former involves a collaborative effort where citizens work with a specific government program to produce a desired good. The latter is carried out by citizens on a parallel yet unconnected track with government. Problem-oriented policing varies from place to place, but shares some common traits: knowledge of community needs and the public's definition of its problems, focus on threatening and fear-provoking conditions instead of legally defined incidents, search for patterns of incidents rather than responding to isolated events, et snn for TrpTTpxSTw/:

communication with policing agencies, access to resources that will ensure continued community participation in setting priorities and policing tactics, and legitimacy as co-producers of environmental protection.

From our analysis of initiatives in Louisiana and California, it appears that the bucket brigades have promoted community awareness and empowerment, provided new sources of information on air emissions, pointed out gaps in existing monitoring and enforcement systems, and helped to increase regulatory and industry accountability. Through a process of NGO-intermediated participation, communities are advancing new forms of participation and strategies of environmental protection. While limited in a number of regards, the bucket brigades offer a vision of community environmental policing that can be expanded and deepened.

The authors would like to thank Archon Fung and Wienke Tax for comments on an earlier version of this paper; Denny Larson, Margie Richard, the Louisiana Bucket Brigade, the West County Toxics Coalition, and bucket brigade members in Louisiana and California for their generous assistance. We also thank four anonymous reviewers for extremely helpful comments.

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