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**Assessing the Effectiveness of California's Underground Storage Tank Annual
Inspection Rate Requirements.**

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Abstract

Several states have experimented with varying degrees of local government implementation of hazardous substances (including waste) regulation. Local implementation allows more coordination of hazardous substances inspections with other local business regulation activities. However, there is the danger that some local governments may not pursue vigorous enforcement because of concerns over business and tax competition. California has instituted the most thorough system of local control over hazardous substances regulation in the nation. It has also gradually put in place a series of measures to attempt to hold local governments to minimum regulatory effort standards and to encourage enforcement actions when violations occur. These minimum standards and enforcement incentives appear to be successful as a whole and offer tools for other states considering local control over various environmental regulations. This report analyzes the minimum standards and enforcement incentives adopted by California.

Keywords: devolution, decentralization, regulation, hazardous waste

JEL classification: H11, H4, H70, Q28, P16

I. Introduction and Problem Statement.

In the hazardous waste area the federal government allows the States to assume the main responsibility for permitting, monitoring and enforcement. The statutes covering hazardous waste are one of many federal environmental programs where the federal government exercises what the political science literature calls “partial preemption.”¹ States are allowed, if they gain federal permission, to exercise permitting and enforcement authority subject to federal minimum standards and approval.² In the past decade, some states have taken environmental federalism a step further by delegating monitoring and/or enforcement authority for hazardous waste programs to local governments, both cities and counties. Greater local control over some hazardous waste programs could be the next step in the progress of environmental federalism and it is important to understand how it has worked in the cases I can examine.

Local control over hazardous waste programs (this paper mainly looks at those programs regulated under the Resource Conservation and Recovery Act or RCRA) offers the possible benefit of more familiarity with local firms and their environmental issues. Also, there may be economies of scope because local governments often conduct inspections of businesses which handle hazardous waste for other programs such as fire safety and stormwater runoff. Local control over RCRA programs allows localities to combine these inspections and save resources for both the public and the firms, which can be freed from multiple overlapping inspections. However, there is also the danger that local governments may devote insufficient resources to pollution problems that spill over jurisdictional boundaries and that they may have insufficient expertise to enforce compliance with the often complex RCRA rules. The environmental federalism literature also points to the danger of a race to the bottom, with competitive lowering of standards to attract business (Oates 2001).

States such as Washington, Arizona, Minnesota, California and Florida have all experimented to varying degrees with local authority over RCRA programs. The States generally follow a partial preemption strategy where some local areas can exercise authority over RCRA programs provided they meet State conditions and/or negotiate agreements with the State government. This could be part of the general trend in U.S. environmental regulation to push regulation beyond large point sources of pollution to smaller, more distributed pollution sources.

Of these states, California has instituted the most thorough devolution of RCRA authority to local governments.³ The grant of authority has been accompanied

¹ Including the Clean Air Act and Clean Water Act, among others (Woods 2006).

² Keleman (2004) discusses the division of authority between the federal and state governments in both the U.S. and E.U. context.

³ In California, local governments have the front-line responsibility for regulating hazardous substances that are stored in various types of facilities as well as hazardous waste. Since hazardous substances often become hazardous waste in production processes, there are likely strong advantages

by policies to try to correct the potential weaknesses of local authority over RCRA programs. One set of policies has set out to provide both uniformity and a minimum level of effort on the part of local government, these include: requirements on the conduct of inspections, minimum inspection rate requirements for some program elements, and audits by the state of the local government programs. Other policies have set out to expand the authority or resources of the local governments, such as: specifically allowing local governments to levy fees on businesses in the program and expanding the share of fine revenues that goes to local governments.

These policies are likely to be considered by any state or province considering devolution of significant environmental responsibility to local governments. In this paper, I examine the effect of these policies with a unique dataset I have collected on local government regulatory effort as well as indicators of pollution. An interesting twist in the California policy is that all counties were mandated to run several RCRA programs, but most cities had to both volunteer and gain county approval in order to run the programs.⁴ In other words, partial preemption was followed at the county not state level.

The California method of granting authority to local jurisdictions seem unusual, but it appears most states which delegate authority over RCRA programs to local government use some version of partial preemption where localities can gain authority over some portion of the program subject to the agreement of the State. The California situation does seem to be unique in that: 1) authority is granted over a wider range of programs 2) counties are mandated to setup programs, rather than the voluntary participation seen in other delegating states. The California program provides an interesting contrast between mandating participation (counties) and allowing voluntary participation (cities).

One RCRA program where the California experience may soon be directly relevant is the Underground Storage Tank (UST) program.⁵ This program deals mainly with petroleum tanks used at retail gas stations. The Energy Policy Act of 2005 requires that all states receiving Subtitle I funding move to triennial UST inspections by 2007. Many states will need to dramatically increase their inspection numbers to comply with this new regulation. One way states may achieve the increased number of inspections is to devolve authority over the UST program to local governments.

to having one agency track both. I do not focus on this aspect of the California program, but it is noteworthy.

⁴ Some cities which had previously been granted authority to run hazardous substance related programs were exempt from a county veto though they were required to coordinate program efforts with their county (SB 1082 1993).

⁵ While USTs are regulated under RCRA nationally, California is one of a few states that had UST programs prior to the inclusion of USTs into the RCRA statutes and, therefore, non-hazardous waste USTs in California do not fall under RCRA's purview. However, in states that did not have pre-1984 UST programs, hazardous waste and gasoline/diesel USTs would be regulated under RCRA. Because RCRA did not pre-empt prior state programs there are a few aspects of the California program that are not harmonized with the federal RCRA UST program.

This report evaluated several of the tools used by California to regulate and manage the local jurisdictions that implement the hazardous substance regulatory programs. I discuss several of the measures and concentrate on the decision to require annual inspections in the Underground Storage tank program.

The lessons learned from the California program can apply to the devolution of any environmental program, whether it is from state to local government or federal to state. Similar policy tools are likely to be used in both types of devolution. The California example gives some insight into how successful these tools are likely to be.

Environmental Federalism and Hazardous waste

For almost every pollution problem there is a tension between the desire for uniform standards and local flexibility. Oates (2001) lays out the arguments for and against local environmental standards. There may be considerable efficiency gains from allowing state or local government to decide their own level of environmental quality because both costs and benefits and therefore the optimal level of environmental protection differ from area to area. However, jurisdictions may not devote sufficient resources to problems that cross jurisdictional boundaries.

In the hazardous substances elements involved in the California program, there is some reason to worry about spillovers from one jurisdiction to others. Underground storage tanks can pollute aquifers of regional significance and hazardous waste generators can emit pollutants that can cross jurisdiction borders. Helland (2003) finds that facilities in counties on state borders tend to emit more pollutants than facilities elsewhere, suggesting that states may do less to regulate these facilities and that jurisdiction spillover issues may well be a serious problem in devolving authority.

In addition, Oates (2005) describes models of jurisdiction behavior that can lead to a “race to the bottom.” If jurisdictions are particularly dependent on taxes on mobile firms, they may be more likely to engage in competitive lowering of environmental standards. In California, this is an issue to a greater degree than most other states because of the property tax restrictions of proposition 13. These restrictions force localities to rely on sales taxes and/or fees to support their programs (Saxton 2002). Therefore, according to the theoretical models, local governments in California are likely to be particularly apt to engage in a race to the bottom if preventative steps are not taken.

Because devolution of hazardous waste programs to the local level has not been studied extensively I cannot locate specific prior research on local authority over hazardous waste programs. However, the experience of other state hazardous waste programs is relevant to the California program. It appears that there is a wide range of variation among states in inspection and enforcement activity (Stafford 2003), with some states devoting few resources to the regulation of hazardous waste generating

firms. This indicates that some areas could have difficulty allocating resources to enforce hazardous waste generators without outside pressure. The mandated minimum inspection requirements in the CUPA program, as well as the efforts to increase the incentives for enforcement, are partially an attempt to forestall any temptation to lower environmental standards to attract business. This potential problem was explicitly recognized in CalEPA (2002).

Hazardous waste is an area where States already have considerable discretion. One of the advantages of greater state or local control of environmental programs is that their different approaches to pollution control can show the nation as a whole more effective approaches to regulation. Sapat (2004) discusses how states have used their discretion in the hazardous waste area to adopt programs that simplify compliance and reduce hazardous waste. Of course, where local governments have control over environmental programs, I can also expect them to adopt many different approaches that can serve as experiments in how to effectively and efficiently control hazardous wastes. Daley (2005) shows that environmental innovation tends to spread among neighboring states.

Allowing local governments to experiment may be even more beneficial. States may be so different as to offer few lessons to each other. (What does New Jersey have in common with Wyoming in hazardous waste problems?). However, urban areas nationwide likely share a similar range of hazardous waste issues, and approaches that work in one city are likely to be worthwhile in other cities. The local control of hazardous waste programs seen in California and other states allows some leeway and experimentation by local governments, though in the California case the limits are fairly tight.

In addition, I can think of local responsibility for hazardous waste generating firms as an innovation in itself. These types of innovations often spread across states (Daley 2005), therefore analyzing the California case can shed light on an environmental innovation that may appear in other states.

State Devolution to Local Governments

A number of states have experimented with devolving some authority over hazardous waste programs to local governments. Often, devolution agreements are only executed with a few local governments who have demonstrated capacity and/or interest in running the programs. Also, most states limit devolution to smaller hazardous waste generators.⁶ Finally, it seems most states limit the local role to monitoring and other information gathering. Enforcement is usually limited to the state environmental agency. The range of hazardous substances programs California devolved, the requirement that counties run the programs, and the devolution of

⁶ These are designated small quantity hazardous waste generators and are those that generate 100-1000 Lbs. of hazardous waste, or smaller quantities if the waste is particularly toxic.

enforcement as well as monitoring authority make California's case the most thorough devolution of hazardous waste and materials authority in the United States and an important bellwether of the effects of future local devolution.

A number of states such as Washington, Florida, Colorado and Minnesota devolve some authority over hazardous waste generators to counties. None have taken the step of devolving authority to cities as well. In addition, the devolution appears to be limited to counties that have expressed an interest in running the programs. Minnesota's devolution is limited to the counties in the St. Paul-Minneapolis Area (personal communication, 2005a). Washington state has devolved the most authority to King County, which is the state's largest county (personal communication, 2005b). Local officials active in the North American Hazardous Materials Management Association are not aware of any other state that has taken California's step of requiring (rather than allowing) counties to monitor and enforce rules for hazardous waste generators (personal communication 2005c). Another unusual aspect of California's devolution is the decision to devolve both inspection and enforcement authority to local governments. Minnesota was the only state other than California among those states I found to have some degree of local control of hazardous waste programs that allowed counties to enforce as well as monitor hazardous waste generator regulations. Though it is beyond the scope of this paper to examine whether enforcement authority should be devolved to the local level, it is an important part of the local control issues.

In the underground storage tank area, Florida and Wisconsin employ a slightly different model to involve local governments. Instead of devolving authority for the UST program, they contract with willing city and county agencies, and in some cases private sector contractors, to perform UST inspections. Payment is either by the inspection (Wisconsin) or conditional on attaining close to an annual inspection rate (Florida). The contractors can and apparently are removed for non-performance (personal communication 2005). These contracting arrangements are an interesting way to leverage the resources of local government while retaining ultimate authority at the state level. Though it is beyond the scope of this paper, it would be interesting for future research to compare and contrast the contracting vs. devolution models for involving local government in hazardous waste regulation.

California Hazardous Waste Devolution

Until 1993, the public response to problems of hazardous waste and materials management was incomplete and fragmented. The prior approach was a poorly designed system of delegation and decentralizing to local governments. Under the overlapping jurisdiction of the Governor's Office of Emergency Services, the State Water Resources Control Board, the Department of Toxic Substances Control, and California EPA (CalEPA), over 1300 local government agencies had fragmented jurisdictions (CalEPA 2001). Each agency regulated some aspect of hazardous

substances generation or treatment, or storage by firms. This “let a thousand flowers bloom” approach to local regulation produced some excellent regulatory programs, but led to a lack of consistency and uniformity. Many businesses complained of confusing and contradictory requirements from multiple regulators with often overlapping responsibilities.

In 1993, then Governor Pete Wilson supported legislation for the Certified Unified Program Agency (or CUPA) program which mandated the consolidation of six major hazardous substances (including hazardous waste) programs by 1997 into one agency in each responsible local government.⁷ This push was driven in part by a desire to ease the regulatory burden on business by decreasing the number of overlapping inspections, fees, and permits. However, the legislation also contained provisions intended to improve the monitoring and enforcement of hazardous substances laws, requiring that every area be under the jurisdiction of a county or city CUPA and instituting minimum inspection procedures and frequencies.

I concentrate on the two CUPA programs, the generator and tank programs, both of which operate under the auspices of RCRA. RCRA mandates the tracking and monitoring of hazardous waste from its generation to its disposal. The Department of Toxic Substances Control (DTSC) oversees the generator program while the State Water Resources Control Board oversees the UST program. Cal/EPA delegates authority to local governments that implement the CUPA program through inspections and enforcement actions in four areas: storage tanks, hazardous waste generating facilities, safety plans for hazardous waste releases, and treatment and recycling facilities. The California EPA, in conjunction with the DTSC and several other agencies, then oversees CUPA efforts and is directly responsible for some large, fully-permitted, hazardous waste facilities.

A key feature of the CUPA program is that cities must volunteer to implement hazardous substances programs and in most cases also need their county’s permission.⁸ This selection process has produced a set of cities with distinctive characteristics. One might expect that volunteer cities are likely to prefer a higher level of regulation than their surrounding county. It turns out that this hypothesis appears correct in the case of the underground storage tank (UST) and hazardous waste generator (HWG) programs. Various indicators of regulatory stringency, including inspections and enforcement actions, suggest that the cities in the program have higher regulatory effort than the counties. However, it appears that the counties have narrowed the regulatory effort gap in recent years-possibly due to state policies intended to increase regulatory effort.

⁷ The six programs were Underground Storage Tanks, Hazardous Waste Generators, California Accidental Release Prevention Program (CalARP), Hazardous Release Response Plans and Inventories (HMMRP), Aboveground Storage Tank Spill Prevention Control and Countermeasure Plan, and the Hazardous Materials Management Plan and Inventory (Article 80 of the CA Uniform Fire Code). Of these, the underground tanks and hazardous waste generators are regulated under RCRA, while the others are regulated under other state and federal statutes.

⁸ Approximately 50 cities (personal communication, James Bohon 11/3/2006) were exempt from seeking county permission out of a total of approximately 400 that had at least facilities that would be regulated under the CUPA program.

Another interesting component of the California devolution is the CUPA audit system. Every three years CUPAs are audited by Cal/EPA to judge their performance in each of the program elements. This should catch any CUPAs that are engaging in the competitive lowering of standards that is predicted by the theoretical models. A CUPA that is consistently not fulfilling its requirements can have its CUPA status revoked.

The framers of CUPA legislation expected every California county to set up a CUPA by January 1997. However, it has been difficult to persuade some of the smaller rural counties to undertake the expense of setting up a unified program. By 2002, four years after the 1997 date, 14 counties still had not set up unified programs (CalEPA 2002). As of February 2005, seven years after the original deadline, all counties now have CUPA agencies.⁹ The difficulty of bringing the small, rural counties into the program reflects the problems small jurisdictions, cities as well as counties, have in setting up new administrative structures. The key difference between cities and counties is that the smaller and less well-organized cities never became eligible to be CUPAs;¹⁰ either because they were not interested in CUPA status or because they did not receive approval. Relatively quick qualification of the remaining counties for CUPA status after the State initiated grants for rural CUPA set-up and training indicates that economies of scale may be such that it is much more difficult for small jurisdictions to set up and run coordinated programs in hazardous waste and other areas.

By limiting the type and number of cities that can qualify for CUPA status, the legislation probably kept quite a few smaller cities that would have difficulty running the program from gaining CUPA status.¹¹ The key element seems to have been the volunteering requirement. Cities that applied for CUPA status had an average population of about 186,655 in 1997 while those that had CUPA facilities but

⁹ One policy innovation that brought the remaining counties to CUPA status was a “rural reimbursement” account that pays some of the administrative costs of CUPA set up and operation (CalEPA 2002). In addition, two counties (Imperial and Trinity) do not have CUPA agencies of their own but instead their CUPAs are administered directly by DTSC, which was designated as the CUPA by Cal/EPA.

¹¹ I concentrate on the CUPA jurisdictions because they are the jurisdictions which in the end are accountable to the states for meeting inspection and enforcement expectations. However, there are additional administrative complexities in the program. One of these is the role of Participating Agencies (PAs). These agencies are usually city agencies that operate one or more of the CUPA elements underneath the jurisdiction of a County CUPA. Another interesting development is the cross-contracting of CUPA programs where some CUPA cities will contract with another CUPA to operate a program element. For example, many of the cities in Los Angeles county contract with a County agency to run their hazardous waste program elements. These elements are interesting because they allow administrative flexibility (PAs) and allow smaller jurisdictions to run their own programs while taking advantage of the economies of scale of a larger jurisdiction (the cross-contracting). However, neither of these elements impacts our analysis of CUPA inspections and enforcement choices because the CUPA jurisdiction is ultimately responsible for the level of effort in their jurisdiction. Choices on PAs and contracting may impact the efficiency of their operation, but these administrative elements do not relieve them of the burden of responsibility for implementing CUPA programs.

did not apply had an average population of 43,658 in 1997. Also, cities which applied had far more gas stations (the location of most USTs) with an average of 48 gas stations in the applicant cities compared to 14 in those that did not apply. These statistics indicate that applying cities would have greater economies of scale in regulation. Cutter (2007) goes into more detail and shows that there are significant differences between those cities that applied and did not apply and argues that cities that didn't apply would have, on average, put forth less regulatory effort in the UST program had they attained CUPA status. The evidence suggests that the volunteering mechanism resulted in a more populous and wealthier set of cities running the program than if, for example, all cities with CUPA facilities had been required to run the program as all counties were required to run the program.

II. Objectives

California has instituted four important policy elements in the original legislation and subsequent follow-up legislation. SB 1082 (1993) consolidated the major hazardous substances regulatory programs in one agency for each responsible local government. The same bill also allowed local governments to set fees on local business so long as the fees were justified by the costs of the regulatory program. Another key element of the reforms was an attempt to set minimum inspection frequency requirements for the underground storage tank section of the program. The minimum inspection requirements increased from triennial to annual with the passage of SB 989, effective January 1, 2000. The change in the minimums allows us to examine how effective these mandates are. The next two policy elements attempt to encourage more enforcement actions by the local governments. The state passed legislation allowing all CUPAs to pursue administrative enforcement actions, these are administratively less costly because they do not require going through a county or city attorney. The state also attempted to increase the reward to local governments of successful enforcement actions by eliminating the state 50% share in fine from hazardous waste generator enforcement actions.

I explore the effectiveness of these reforms by characterizing changes in local inspection and enforcement efforts of local governments.¹² Since these policy elements, except for the single-fee element, were instituted after the program began, I can compare statistics on local inspections and enforcement before and after the program elements were instituted.¹³

¹² This paper includes data on all 28 cities that attained CUPA status and 40 out of 58 counties. 18 counties were dropped from the comparison either because they had not achieved official CUPA status until recently or because they consistently failed to report inspections and enforcement information. These are almost all smaller, rural counties. If there data was available it is likely that they would report low inspections and enforcement numbers, since many were not officially certified.

¹³ One caution in using these statistics is that they may understate the regulatory effort, particularly in the enforcement arena, of the large, urban counties. A single reported enforcement action might be a huge case involving many different violations, locations, and jurisdictions. However, inspections are more standard across jurisdictions than enforcement cases.

III. Procedures

Data

I collected data from several different sources for this research. The most important source is the record of inspection, violation, and enforcement information gathered from the CUPA administrative record. Explanatory variables representing cumulative underground storage tank spills within each jurisdiction are taken from the Leaking Underground Storage Tank Information System (LUSTIS) database. I also collected data from the Toxics Release Inventory from 1998-2003 for California.

A major part of the examination of the effect of the inspection rate mandate was matching underground storage tank facilities to leaks in order to examine the efficacy of the inspection rate mandates at the individual facility level. I restricted ourselves to retail gasoline stations as California Energy Commission has a database of all such facilities in the state. This dataset was geocoded as well as the leaks database and matched UST leaks to retail gasoline facilities spatially, by the name of the facility, and by address. I restricted the leaks to ones that occurred post 1998 so that I would only examine leaks that occurred after the major technological upgrades to USTs had been implemented. The matching procedure only succeeded in matching about 800, or slightly more than 10% of the leaks to retail gasoline facilities. The low match rate casts some doubt on that portion of our results. It also points out a flaw in California's data collection-the inability to track pollution outcomes in the LUST program by facility. This flaw makes it difficult to analyze the success or failure of the regulatory program. I use normal statistical tests and regression analyses to examine the policy measures discussed earlier.

IV. Results

Leaking Underground Storage Tank Regulation

Among CUPA programs, the leaking underground storage tanks and hazardous waste generators represent two significant threats to human health and the environment in California and nationwide. The principal public concern about underground storage tanks in recent years has been the contamination of groundwater supplies with Methyl Tert-Butyl Ether (MTBE), a gasoline additive. The CUPAs are the front-line regulators of USTs, which are responsible for the lion's share of MTBE contamination, as well as contributing to other soil and water contamination. In response to the MTBE crisis, California increased the required inspection frequency for tanks from triennially to annually, effective in FY 2000-01 (SB 989). (Table 1

shows various aggregate statistics for USTs and Table 2 shows the same statistics for generators.)

Though not every CUPA inspects UST facilities annually, Table 2 shows that in the aggregate California is now averaging over one inspection per facility each year. Though there does not appear to be any published surveys of state UST inspection rates, an EPA analyst (personal communication, Jerry Parker) indicated that only a few states are near or above annual inspection frequencies (personal conversation, 2006) and most are probably around triennial inspection rates or below. The analyst indicated that Florida and Wisconsin conducted inspections at about annual frequencies and South Carolina was slightly less than annual. Interestingly, both the Florida and Wisconsin programs are structured similarly to the California programs, with counties or other local governments significantly involved in the UST inspections.¹⁴ Overall, it appears that California ranks with the best state programs in its aggregate inspection rates.¹⁵

In addition to their other duties, CUPAs implemented the federal requirement that all tanks be upgraded to new, more leak proof standards by the end of 1998. By the end of 1999, most tanks were in compliance. The data from California, shown in Figure 1, show that the tank standards upgrade seems to have reduced the number of leaks substantially.

Because most of the leaks from USTs occur in the county CUPA's jurisdiction (as opposed to in the 29 cities), it is not surprising these declines in leaks mostly occurred in the County CUPAs.¹⁶ Figure 2 shows the trend for the average number of leaks per facility with a UST for cities and counties. The average rate of leaks has declined in both the city and county CUPAs since tanks were upgraded to the 1998 requirements. The figures raise several interesting questions. Figure 2 shows that cities on average have fewer leaks per UST facility, even in the post 1999 period, at a time when there should not be significant differences in tank construction (the county rate is higher than the city rate at the 1% significance level). It is also difficult to attribute these differences to differences in the size or type of facilities between cities and counties, since well over 90% of the UST facilities are gas stations which almost all have the same number of USTs (3 to 4 on average). However, it appears that the gap between cities and counties is closing in recent years.

¹⁴ These two states involve local governments, mainly counties, in UST inspections, but there is a significant difference from the California model. In Florida and Wisconsin, local governments voluntarily bid for inspection contracts and are paid directly by the state agency to perform a state-determined number of inspections. They can and are fired for non-performance. This is in contrast to California where regulatory authority is formally devolved to the local governments who themselves make decisions about regulatory effort.

¹⁵ It would also be desirable to look at other indicators such as enforcement actions and compliance rates, but these are probably not comparable across states.

¹⁶ Data are for 44 of the 58 California counties. Fourteen counties did not have CUPA status until after 2002 meaning that data were unavailable for these counties. These counties generally did not qualify because they were not operating hazardous waste programs to State standards. Had data been available, it is likely that inclusion of these counties would make county performance for underground storage tanks appear worse than is presented here.

I need to break this out better by time period, not quite convincing. What accounts for the differences between cities' and counties' leak rates? Differences in regulation may account for some of this observed difference in leak rates. Cities conduct more regular and overall inspections than counties. Cities have a 23% higher rate of regular, scheduled inspections (.86 to .69), and a 8 percent higher rate of overall (followup and scheduled) inspections. Cities average 1.3 per facility per year for and counties average 1.2)¹⁷ These difference could be driven by the city selection process or by cities' generally being in better financial condition than counties. In recent years, however, the county-city inspection gap has closed substantially. From 2001-2004 cities have a 9% higher regular inspection rate and only about a 1% higher overall inspection rate. The closing of the county-city gap is mainly due to counties increasing their inspection rates.

Given the larger number of leaks in the counties, I would expect to see an equal or greater rate of reported violations for USTs in the counties. However, there are many more reported violations per UST facility in the authorized cities. Violations per UST facility were 43% higher in the cities, despite the lower leak rates (difference significant at the 1% level. In the 2001-2004 period, violations per UST facility were 30% higher in the cities (difference significant at the 5% level. This outcome suggests that one of the reasons cities are discovering more violations per UST is because of their greater monitoring effort. As the counties increased their inspection rates, the gap in violations detected per UST facility narrowed.

A possible explanation for the above findings is that the CUPA cities are largely in urban areas while some of the counties are rural (though most rural counties are not in the dataset because they were not CUPAs for much of the time period or they did not report data consistently.). This could impact the leak rate findings, as rural areas have more leak prone single-walled tanks (personal communication, James Bohon, September 2006). To analyze whether cities are different from comparable counties I analyzed the differences in UST program performance metrics between cities and the counties the CUPA cities are located in. Cities have a UST leak rate 17% lower than the counties they are in (significant at the 5% level) in the 2000-2004 time period. The city regular inspection rate is 26% greater than the rate of the counties they are in (significant at 1%) while the overall inspections rate is 5% higher. Finally, violations detected per UST are 37% higher than the county they are located in (significant at the 1% level). This comparison of cities with the counties they are in shows that the differences in performance between City and County CUPAs in the UST program are smaller when only the most comparable counties are considered, but are still significant.

Of course, inspections are just one part of the enforcement story. For effective enforcement, local governments must follow up on inspections by correcting any violations they find through formal or informal enforcement actions. Again, it appears cities are outperforming counties when I look at the ratio of enforcement actions to violations. In recent years (FY 2001-2004), the average of enforcement

actions/violations shows cities respond with 78% more enforcement actions (i.e. close to twice as many enforcement actions) to each violation.

The analysis above suggests that the SB 989's (the legislation that requires annual inspections in the UST program) focus on increasing inspection levels is well targeted. The cities, with their generally higher levels of inspection, appear to detect more violations and have fewer leaks. These results do not show causality, but they are consistent with the hypothesis that more inspections cause fewer leaks.

The data indicates that the SB 989's inspection mandate was effective at increasing inspections. Jurisdictions that averaged less than annual inspections in the pre-mandate period (1998-2001) had a statistically-significant increase in their inspection rates from the pre-mandate to the post mandate period (2001-2004).¹⁸ They increased inspection rates from about .82 inspections/per year to 1.19 inspections per year or an increase of 44%. Those jurisdictions that already averaged annual or more frequent inspections before 2001 saw their inspection rates increase by 11% to 1.5 inspections per year. The much greater increase in the group which was most likely impacted by the inspection rate mandate suggests that SB 989's mandate increased inspection rates did have a significant impact on inspection rates. In addition, these results suggest SB 989 played a part in the narrowing of the inspection rate difference between cities and counties. Most of the jurisdictions in the below-annual inspection group were counties, so the annual inspection rate mandate affected the county average UST inspection more than the city average rate.

Preventing Pollution

Inspections are not the end goal; pollution prevention is the aim of the inspection requirements. The relationship between inspections and tank leaks is difficult to untangle because increased inspection rates will likely induce more care by tank owners and prevent leaks but will also result in detecting a greater proportion of leaks, so it is not clear how inspection rates will affect detected tank leaks and violations. Also, since leaking tanks are likely to be replaced with new tanks that are less likely to leak, a higher inspection rate in the past may lead to fewer present leaks. However, a recent paper studying UST inspections finds that inspections do have a small deterrent effect on future violations (Eckert 2004). So there is good evidence that inspections do decrease pollution.

I first test the effect of the mandate by analyzing whether those jurisdictions subject to the mandate (i.e. those below one inspection/year) had larger decreases in their leak rates than those not subject to the mandate by comparing the leak rate in the period directly before the mandate (1999-2001) to the period since (2002-2004). Both the absolute decrease and the percentage decrease in rates are similar for the two sets of jurisdictions. Compliant jurisdictions have a decrease of .05 leaks per year

¹⁸ If all 3 years of inspections were not available I used the average over the non-missing observations from 1998-2000.

per facility or a 60% decrease. Non-compliant jurisdictions have a decrease of .03 leaks per year per facility or a 37% decrease.

Violations may occur even when leaks are not detected, so I examined the data further to test the relationship between reported violations and inspections. I hypothesize that current inspections should increase the number of violations detected but past inspections should decrease violations. Past inspections should decrease violations because they will correct violations and there will be fewer violations for present inspection to uncover and a greater frequency of inspections in the past should induce tank operators to take more care. Finally, I allow inspections (present, past, routine and non-routine) to have different marginal effects depending on whether the CUPA is a city or a county. Because of the observed differences in inspection frequency and violation rates between cities and counties, it seems possible that there may be a difference in the average effectiveness of inspections.

Table 3 shows fixed effects panel data regressions relating the current violation rates in a jurisdiction to current and lagged inspection rates.¹⁹ The time period was from 2000-2004, after the key tank replacement deadline, so tank technology should be similar across jurisdiction. In addition, by using a fixed effects specification I control for any time-invariant jurisdiction specific-effects. However, I also included the lagged tank leak rate and year dummies to control for changes in tank technology and year-specific effects due to changes in regulatory protocols. The regression shows a fixed effects regression with current and lagged inspection rates and these controls.²⁰ The coefficient on current inspection rates is significant and positive, indicating that greater current inspections are associated with a higher number of detected violations. The coefficient on lagged inspections is insignificant. Inspection rates does seem to result in increased detection of violations

In order to further investigate the effect of the inspection rate mandate I examined the matched UST facility-LUST data. I have some concern about the accuracy of these results because I was only able to definitively match slightly more than 10% of the leaks reported in the 1999-2006 period. There are several possibilities to explain the low match rate. Retail gasoline facilities may be a low proportion of overall leaks. Also, it is possible that many of the currently discovered leaks are in facilities that are not currently operational and would not be in the California Energy Commission database. Finally, errors in the leaks or Energy Commission facility database may inhibit any matching procedure. If such errors are random noise, than the results are valid. However, if errors are systematic such that some areas are less likely to generate matches than the validity of the regression results is questionable.

¹⁹ I use data from 2000-2004. Because of high tank replacement activity due to the 1998 deadline it is doubtful that years before 2000 represent a normal relationship between inspections and violations. Also, the 2000-2004 period is when the inspection rate mandate came into effect so limiting the regression to this time period is a better way to test the effectiveness of increasing inspections.

²⁰ Controls are lagged tank leak rates, year dummies, and a county dummy variable.

Only a small proportion of retail gasoline facilities were matched to leaks in this period (753 out of 9330 retail gasoline facilities) and only 27 were matched to more than one leak. Therefore a probit model is used that examines the probability of a gas station ever having a leak. The major question is whether the inspection rate increase that occurred after the inspection rate mandate passed had any affect on the probability of leaks. The independent variable (*lkcnt_p1*) is a one if the station had a leak after the inspection rate mandate passed (2002-2006). The key dependent variable of interest is *insp_av_p1*, which is the average inspection rate in the period after the inspection rate requirement went into affect (post 2002). The coefficient on this variable is expected to be negative, as more inspections should induce more care and less leaks by station owners or operators. I also control for the average fine amount collected in the UST program both before and after the mandate (*avgfine_p0* is the average fine before the mandate and *avgfine_p1* is the average fine after the mandate.) Our hypotheses is that *avgfine_p0* should have a negative effect on leak rates as greater fines should induce more care and that *avgfine_p1* likely positively correlated with leak rates since the more leaks that are caught, the more fines are likely to be assessed. Next, I control for the number of leaks that occurred in the zip code of the station prior to the inspection mandate (*zplkcnt*). The number of leaks controls for properties inherent to the soils or other factors in the area and is expected to be positively correlated with the leak probability. Finally, I control for whether the station is affiliated with one of the major brands (*branded*.) The coefficient on this variable could be negative if the major brands have more sophisticated environmental control operations. Alternatively, it may be that smaller chains or individually-owned stations take more care because of the direct consequences to their finances.

A key concern in this regression is measuring whether the effectiveness of the increased inspections after the inspection rate mandate varied by the pre-mandate inspection rate performance. One possibility is that the jurisdictions with low inspection rates increased their inspection rate but decreased inspection quality so that the increased inspections might not have much effect. Another hypotheses is that jurisdiction generally know which facilities are problematic, so that increased inspections will have a low marginal effect. The regressions try to capture differentials in the marginal effectiveness of inspections several different ways. As a baseline, the regression in column (1) in Table () assumes the same marginal effectiveness of inspection rates across jurisdictions. Next, in column(2) the regression adds the interaction of *insp_av_p1* with one minus the 2000 inspection rate. The resulting variable is named *reg_bind*. This allows the marginal effectiveness of the inspection rate to vary continuously with the pre-mandate inspection rate. Finally, column (3) examines the marginal impact of inspection rates for jurisdictions just above and below an annual inspection rate in 2000. By using just this sample of data one can determine the marginal effectiveness of inspections for station in jurisdictions with similar pre-mandate inspection rates, some of which are impacted by the mandate (those just below the annual inspection rate mandate) and the others which were not.

Overall, the regressions have a low significance level- most of the variation in leak probability appears to be due to factors outside of the model. As expected, the coefficient on *insp_av_pl* is negative and significant in the base regression. A higher number of inspections is correlated with a lower probability of leaks. The coefficient on the interaction term *reg_bind* is positive and significant, indicating that the higher the pre-mandate inspection rate the lower the marginal effect of post-mandate inspections. This suggests that for jurisdictions with initial low inspection rates the mandate-driven increase in inspection rates is correlated with a lower leak probability. However, for those with relatively high inspection rates, the marginal effect of additional inspections is low. This is confirmed by the third regression, which looks at the effectiveness of inspections for stations in jurisdictions just above and below annual inspections in 2000. For these stations the marginal effect of additional inspections is insignificantly different from zero. Taken together, the evidence suggests that the inspection rate limit was likely too high, the real value of the mandate was in forcing the jurisdictions that had very low inspection rates to increase their inspections. The results suggest that jurisdictions that had pre-mandate inspection rates above .8 gained little from the increased inspections.

The *branded* variable is positive and significant across all specifications. This indicates that stations associated with major brands are more likely to have leaks. The available information does not explain why, it could be differences in area, differences in technology, or differences in care. The other finding is that the number of leaks in a zip code has the expected positive sign and is borderline significant. The coefficient on the average fine variables is positive and usually significant. This is likely due to reverse causality-the fines are driven by the number of leaks detected.

Another factor that should be considered is that detecting violations early is important because the real damage from tank leaks comes from leaks that go undetected for long periods of time. These leaks are the ones that are likely to contaminate large areas of soil, or worse enter into groundwater (Sementelli 1997). Inspections may be most helpful for catching small leaks, or violations that may turn into leaks, before they turn into these large leaks. Evidence from other papers (Eckert 2004) suggest that increased inspection and enforcement activities reduce the duration of violations and it is probable that inspections have a similar effect in the case of USTs. Therefore, though it is beyond the scope of this paper to test a direct link between the inspection mandate and lower tank leak rates, the increased inspection rates due to the inspection rate mandate is likely decreasing the severity of leaks.

Local Administrative Capacity and Enforcement Effort

Two key provisions of the original legislation limited local administrative capacity. Originally, half of fine revenue for hazardous waste program violations prosecuted by local governments went to the DTSC. This was a large disincentive to

local agencies pursuit of often expensive environmental cases. In response to a report from the Legislative Analyst's Office (LAO 2001) criticizing the sharing law and other enforcement problems, AB 711 (2001) was passed and now all fines stay in local hands.

Another key administrative weakness identified by the LAO report is the lack of a uniform process for administrative enforcement actions to correct or punish violations. Some localities had implemented their own administrative enforcement process for other programs, but many had not. Administrative processes are cheaper and faster than civil penalties because they usually do not require the same level of proof as a civil case and there is no need to convince a local DA to take the case. Recent legislation (AB 2481, 2002) has established an administrative enforcement process for all programs that will hopefully increase enforcement consistency across CUPAs.

The effect of eliminating the state share of fine revenue for hazardous waste violations should be to increase the number of hazardous-waste related administrative or civil enforcement actions pursued by the local agencies. The effect of universal administrative enforcement authority should be an increase in administrative enforcement actions in both programs.

There is an uncertain effect in the gross numbers of civil enforcement actions in the hazardous waste programs pursued by agencies. The numbers of civil enforcement actions increased from an average of .47 per agency/year in the period before the legislation to .95 per agency/year after the legislation and the difference is statistically significant at the 10% level. However, this mainly reflects the low number of civil actions in 1998, at the beginning of the CUPA program when the procedures for referring violations to a legal process were still unclear. In FY 2000/2001, directly before passage of the law, agencies reported pursuing a total of 74 civil actions, from FY 2001/2002-2004, this total was only exceeded once with 79 civil actions in 2002.²¹ A complicating factor is that the California budget crisis (beginning in 2001) led to reductions in funding for many County District Attorneys, who are the ones who usually would prosecute environmental crimes. In light of the budgetary situation, it could be that the legislation helped maintain enforcement numbers.

The new legislation on administrative enforcement does appear to have resulted in more enforcement. The CUPA agencies did not report any administrative enforcement actions in the UST program in the years prior to the passage of the legislation and reported an average of .45 administrative enforcement actions per CUPA per year in the years after the passage of the legislation. In the generator program, the rate of administrative enforcement actions more than doubled from .68 to 1.39 administrative enforcement actions per agency per year. In both cases, the latter period is significantly greater from the prior period at the 5% or greater

²¹ The analysis of enforcement and violations is hampered by a year of missing data for FY 1999/2000 (enforcement and violations are missing but there are inspection statistics).

significance level. However, one caution on these results is that it appears that much of the increase stems from the increased use of administrative actions by a few large jurisdictions. These suggest that the AEO legislation increased enforcement but the effect may be limited to a few jurisdictions.

Of the two administrative reforms, it appears there is evidence that the increased ease of administrative enforcement did increase the number of actions. There is no conclusive evidence on the effect of the elimination of the state share of enforcement revenue. However, currently we lack the information to accurately judge the effectiveness of CUPA enforcement at the facility level. At the state level, CUPAs only report summary totals of violations and enforcement actions. This reporting methodology is very different from most national EPA enforcement databases which document which facility committed a violation, the extent and type of the violation, when the violation was corrected, and any enforcement actions that occurred as a result of the violation.²² This type of information is essential to determining whether persistent violators eventually face enforcement action and for determining how long violations go uncorrected. A similar system would be very useful for future evaluations as well as to guide state oversight of the CUPA program.²³

V. Conclusion

California's delegation of significant control over hazardous waste enforcement to local governments appears to be a model with significant successes, along with some aspects that may be better avoided. Overall, it has probably resulted in more inspection of these facilities than any program run directly by the State could hope to achieve. It would be very expensive for the State to set up independent local offices that would conduct the number of inspections that have occurred under the current regime. Other states with high inspection rates also leverage local government resources to achieve these inspection rates.

Allowing interested and qualified cities to run the programs seems like a positive aspect of the program. The cities have by and large moved quickly to implement the programs and maintain high levels of inspections. However, the decision to require all counties to implement the programs has been less successful. Smaller, rural counties have either not set up programs or have not done a good job of meeting state standards. Even the urban counties that are more comparable to the cities report lower effort in a number of facets of the program. Though state subsidies have now brought many of smaller, rural counties into CUPA status, it is

²² For USTs there is a system (LUSTIS/Geotracker) that tracks leaks and subsequent regional or state board enforcement actions.

²³ The CUPA program is currently developing plans for more complete reporting, but it is unclear if violations and enforcement tracking will meet national standards. Current plans are to report violation and enforcement information for the larger hazardous waste generators by early 2006, and later extend this reporting to other facilities.

still an open question whether they will be vigorous inspectors. Two alternative approaches might be more fruitful: 1) direct state implementation in counties that are not willing to volunteer;²⁴ or 2) formation through cooperative agreements of multi-county entities to conduct the programs.²⁵ The second approach would avoid instances where counties have just a few regulated businesses and thus very high costs per regulated entities.

The move towards annual inspection rates in the UST program seems like a partial success. It has brought inspection rates up for jurisdictions that originally had lower inspection rates and those same jurisdictions are detecting more violations in general. However, the results suggest that increased inspections only decrease leak probability for those jurisdiction that began with very low inspection rates. It appears that the other jurisdiction could have better used the resources dedicated to implementing the annual UST inspection standard in other programs.

The adequacy of CUPA enforcement behavior is much harder to evaluate.²⁶ No firm-specific violation or enforcement data are currently reported. More critically, the CUPAs do not have a system at the state level to monitor the re-achievement of compliance once a violation is identified. Because of the lack of state level tracking of specific firms and violations we lack hard data to ascertain whether individual jurisdictions are truly pursuing energetic enforcement programs. CUPAs are evaluated triennially by the State and enforcement and other issues are examined, but the evaluations do not provide numerical data to examine CUPA enforcement behavior at the firm level. Cal/EPA is currently developing a statewide, firm-specific, system to make this information available. California, and other states pursuing local devolution, should institute this type of transparent and publicly available enforcement tracking systems so the public can ascertain whether local jurisdictions are devoting appropriate resources to environmental enforcement.

²⁴ In fact, the county program in Imperial county is directly run by state departments so this solution is partially in effect.

²⁵ The Florida UST program tries to encourage multi-county jurisdictions for smaller counties where one county has the UST inspection contract for several surrounding counties.

²⁶ Both Legislative Analysts Office 2001 (“Analysis of the 2000-01 Budget Bill: State Agencies Can Do More”) and the California State Auditor 1999 (DTSC: The Generator Fee Structure is Unfair, Recycling Efforts Require Improvements, and State and Local Agencies Need to Fully Implement the Unified Program”) have noted weaknesses in CUPA enforcement capabilities and performance.

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Table 1: Summary Statistics

(Each observation is a jurisdiction-year)

Variable	Obs	Mean	Std. Dev.
Underground Storage Tank Facilities			
Number	463	269.05	456.94
Inspections	448	205.93	345.90
Inspection Rate	448	0.95	0.68
Violations	476	52.47	144.32
Enforcement Actions	476	62.08	182.90
Violation Rate	463	0.21	0.29
Hazardous Waste Generators			
Number	460	1116.00	1961.25
Inspections	444	520.22	1101.21
Inspection Rate	440	0.51	0.49
Violations	476	198.20	562.08
Enforcement Actions	476	153.97	480.78
Violation Rate	458	0.20	0.42

Table 2: Underground Storage Tanks

Year*	Facilities	Inspections	Violations	Enforcement Actions
1998	20025	12444	3035	2382
1999	19357	12947	3616	3908
2000	18319	8931	NA	NA
2001	17490	12230	3241	3626
2002	16995	15494	4368	5465
2003	16528	14020	4923	6223
2004	15858	16191	5795	7948

* These are the latter half of each fiscal year, so 1998 is FY 1997-1998 etc.
NA=Not Available, 1999-2000 Enforcement and Violation data is missing.

Table 3: Underground Storage Tank Violations and Inspections.

Independent Variable: Violation Rate (Violations/UST Facility)

Inspection Rate	0.110 (5.24)***
Inspection Rate (1 year lag)	-0.019 (0.89)
Constant	0.112 (2.83)****
Observations	365
R-squared	0.18

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Inspections Decrease the Probability of Leaks.

	(1)	(2)	(3)
	Dependent Variable: Leak (2002-2006)		
VARIABLES			
<i>insp_av_pl</i>	-0.851*** (-4.064)	-0.814*** (-3.810)	0.583 (0.811)
<i>reg_bind</i>		0.344*** (4.070)	
<i>insp_av_pl*(>1 pre mandate inspection)</i>			0.382 (0.404)
<i>insp_av_p0</i>	0.032 (0.339)	0.136 (1.424)	0.422 (0.532)
<i>avgfine_pl</i>	0.013*** (2.704)	0.012** (2.488)	-0.178 (-0.672)
<i>avgfine_p0</i>	0.043* (1.752)	0.063** (2.473)	
<i>zplkcnt</i>	0.004** (1.988)	0.003 (1.623)	0.005 (0.713)
<i>branded</i>	0.276*** (5.629)	0.290*** (5.877)	0.261** (2.272)
<i>Constant</i>	-1.180*** (-6.192)	-1.436*** (-7.112)	-2.778*** (-2.767)
<i>Observations</i>	8534	8534	2129
R-squared		0.0181	0.0232
			0.01
*** p<0.01, ** p<0.05, * p<0.1			
z statistics in parentheses			

Figure 1 Reported Leaks from Underground Storage Tanks by Media Affected

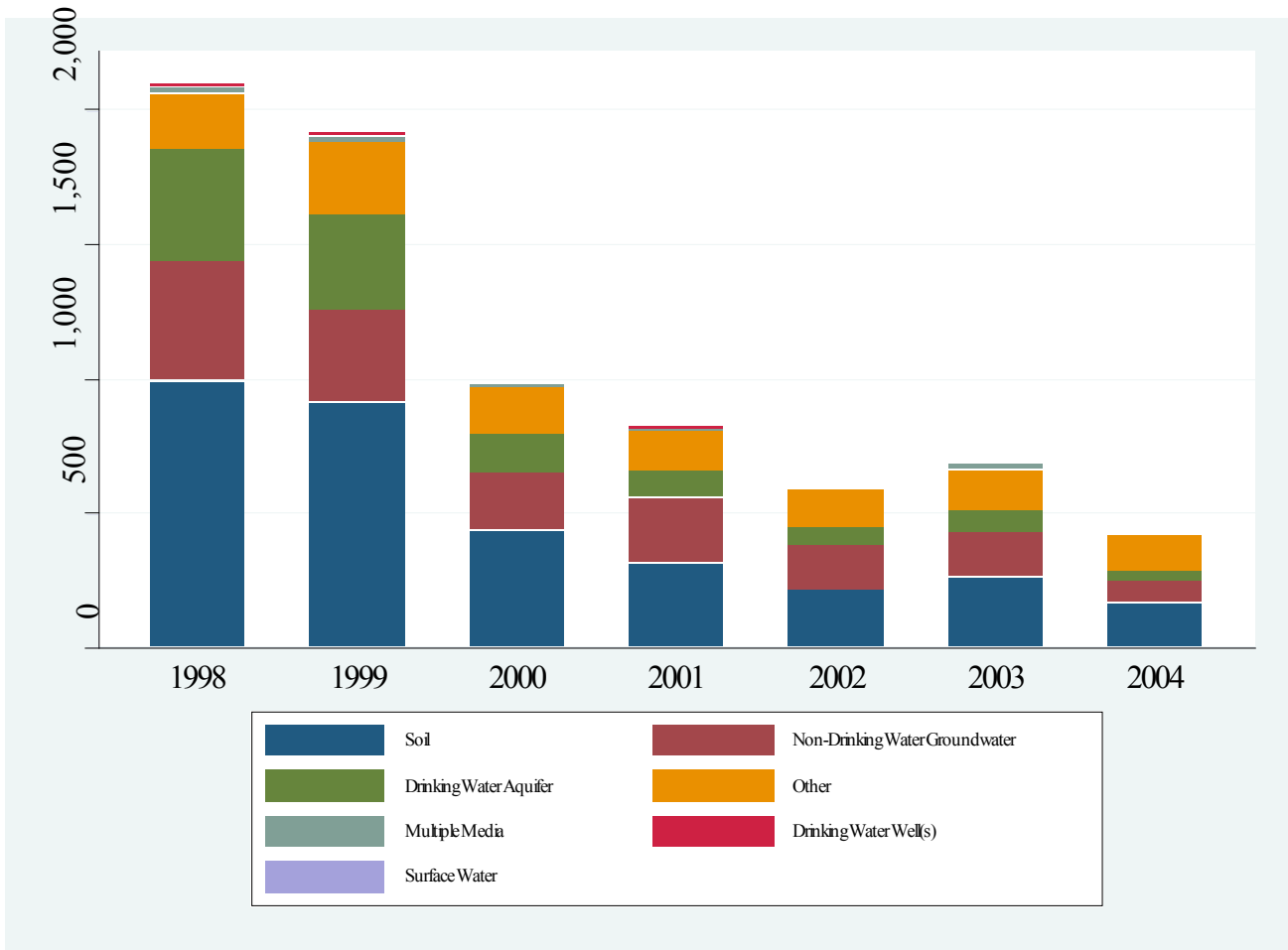


Figure 2: Reported Leaks from Underground Storage Tank Facilities

