REPORT OF THE STATE WATER RESOURCES CONTROL BOARD'S ADVISORY PANEL ON THE LEAK HISTORY OF NEW AND UPGRADED UST SYSTEMS

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Introduction

In October 1997, in response to increasing reports of MTBE releases from underground storage tanks (UST), Governor Wilson issued a signing message for SB 521, SB 1189, and AB 592 requesting that further actions be taken to ensure that oxygenates [such as methyl tertiary butyl ether (MTBE)] do not find their way from leaking UST systems into the environment. The State Water Resources Control Board (SWRCB) was asked to convene an advisory panel of knowledgeable people to:

> Review existing databases of UST contamination sites to determine if there is a leak history associated with UST systems meeting the 1998 federal and state standards; and if so, identifying appropriate measures that would assure the prevention and detection of oxygenate releases from retail marketing facilities.

This report presents the findings and recommendations of the panel.[1]

Background

Program History

Prior to 1984, California did not have a uniform regulatory program for USTs. Commonly, UST systems installed before that year consisted of single-walled bare-steel tanks and piping which were subject to corrosion and undetected leaks. Under a statewide regulatory program that became effective January 1, 1984, all new UST systems were required to meet standards for corrosion protection, leak detection, and spill and overfill prevention. In addition, new systems were required to include secondary containment which was capable of holding any leak from the primary containment until the leak could be detected and cleaned up. In 1990, to be consistent with federal rules, a requirement was added to the California program to upgrade all older systems to meet minimum standards to protect against corrosion, prevent spills and overfills and to address other deficiencies in the older systems. The deadline for meeting the upgrade requirements was set for December 22, 1998, the same as in the federal program.

Characteristics of Post-1998 UST Systems

The post-1998 UST population will include both new and upgraded systems. All post-1998 systems will include corrosion protection, spill and overfill protection devices, and some form of leak detection. Systems can be grouped as follows:

[1] Governor Wilson also asked that the panel evaluate refueling facilities and practices at marinas located on surface water bodies serving as drinking water sources, and determine if any further upgrades should be made to eliminate releases to the water bodies. That effort is covered in a separate report.

1. Secondarily-contained systems - These systems consist of double-walled tanks and piping with continuous interstitial leak detection and under-dispenser and pump turbine containment sumps which are continuously monitored. If installed and maintained properly, these systems provide the maximum protection against releases. (Some secondarily-contained systems were installed without under-dispenser containment and, in some cases, pump turbine containment sumps. If installed after July 1, 1987, these features must be present for the UST to be in full compliance.)

2. Hybrid systems - Prior to July 1, 1987, some motor vehicle fuel UST systems were installed with a double-walled tank and single-walled piping. The piping is monitored by an automatic leak detector capable of shutting off the pump when a leak rate above 3 gallons per hour (gph) occurs. Annual pressure testing capable of detecting a leak rate of 0.1 gph is also performed.

3. Single-walled systems - These systems were installed prior to January 1, 1984, and consist of single-walled fiberglass or corrosion-protected and lined steel tanks monitored with monthly leak detection at a 0.2 gph rate and single-walled piping (corrosion protected steel or fiberglass) equipped as above.

The number of systems fitting each of the above groups that will be in operation after the deadline is unknown. Many of the non-upgraded, pre-1984 tanks will be operated up to the deadline and then closed, so it is unknown at this time how many single-walled UST systems will remain. It is expected, however, that most tank systems will be double-walled. The major exception will be single-walled fiberglass tanks, which were not generally affected by the upgrade program because of their intrinsic corrosion protection. The SWRCB will work with local UST agencies to develop data on the post-1998 UST population.

Panel workplan

The panel divided into three teams to accomplish the following tasks:

Task 1: Evaluate the compatibility and permeability of UST systems for MTBE and other oxygenates. The activities of this team included a literature review, review of industry standards, and a survey of UST system manufacturers.

Task 2: Follow-up on reports of releases from upgraded facilities to determine if the release was in fact from the upgraded system, and, if so, to identify the probable source and causes of the release. Cases were selected from local agency referrals.

Task 3: Compile and evaluate data on a large number of UST release cases and develop statistics on the types of UST systems that have experienced releases, the sources and causes of those releases, and whether leak detection was instrumental in finding the releases. This task was accomplished by having local agency inspectors throughout the state complete survey forms developed by the panel.

Each team has prepared a detailed report which is available from the SWRCB (800-999-8844) or on the UST program web site (www.swrcb.ca.gov -- click on "underground storage tanks.") The findings and recommendations of the three teams have been combined into this report.

Panel Findings

1. There is evidence of releases from new and upgraded UST systems. However, it could not be determined based on available data whether there is a statistically significant leak history associated with properly-installed, operated, and maintained UST systems meeting the 1998 standards. Most available data evaluated in this study are skewed toward facilities with known releases, older systems, and/or systems with non-upgraded components.

2. Releases found at UST sites meeting the 1998 standards generally appeared to be the result of improper installation, operation, or maintenance. The relative extent to which these systems occur in the overall UST population is unknown.

3. Additional research is needed to quantify the leak history for the post-1998 UST population before it can be determined what, if any, changes to the current design, construction and monitoring standards are needed to assure the prevention and detection of oxygenate releases at UST facilities.

4. Immediate improvements are warranted in areas such as owner/operator, contractor, and inspector training; regulatory agency inspection and enforcement procedures; operator compliance with leak detection and response requirements; and facility management practices.

5. Due to its water solubility and environmental persistence, some occurrences of MTBE in groundwater at petroleum dispensing facilities may result from small spills during tank filling, dispensing and maintenance operations, rather than leaks from UST system components. Other constituents of gasoline may not be detected because of volatilization, adsorption to soil particles, or biodegradation.

6. Existing information indicates that MTBE and other ethers blended with gasoline are generally compatible with UST system components in liquid phase, and that releases should not occur due to the deterioration of system components from contact with these ethers. However, some polymeric materials may be subject to swelling and softening when in contact with alcohols, either neat or blended with gasoline, or neat MTBE. Alcohols and alcohol/gasoline blends should not pose compatibility problems if existing industry recommendations for component materials are followed.

7. It is commonly held that, because of the larger molecular size of MTBE relative to methanol, any material which is compatible with methanol will not allow

permeation of MTBE. However, this is not a rigorous theory, and is not a substitute for direct measurement.

8. There is insufficient information available to determine whether there are UST system material compatibility or permeability problems associated with vapor phase MTBE.

9. Current UST product component testing for compatibility and permeability does not include consistent performance criteria for safe operation and environmental protection. Results of testing conducted by third parties are generally treated as proprietary by the UST equipment industry. The federal and California UST regulations do not require UST equipment manufacturers to report third-party testing results for performance of tanks, piping, or other UST system components, as is required for leak detection equipment.

10. There is evidence that leak detection programs may not be performing as intended. This finding is based on the fact that less than 4 percent of releases reported during a 24-month period beginning June 1, 1996, were discovered by a leak detection program. It appears that in many instances tank owners are simply not conducting the leak detection tests required or are performing these tests infrequently.

11. There is no standard procedure to test the integrity of secondary containment and no regulatory requirement to do so except at the time of initial installation. Consequently, it cannot be determined if secondary containment is able to perform its function of containing a release from the primary containment until it can be detected and cleaned up. This is especially important for systems with non-integral secondary containment because water intrusion into the interstice casts doubt as to the integrity of the secondary containment.

12. Several common critical components in UST systems were found to be the source of a disproportionate number of releases. These include under dispenser piping, pipe fittings, and turbine sumps.

13. Based on available data, the age of a UST system appears to be a significant factor in increasing the potential for a release. This may be due to increased likelihood of component corrosion or deterioration and use of outdated technology.

14. There appears to be a lack of adequate enforcement against owners/operators who are not complying with leak detection requirements or who fail to follow-up on suspected releases.

Panel Recommendations

The panel was able to reach general consensus on the recommendations listed below. As can be expected from a panel of diverse interests, these recommendations often represent a compromise, and may not be the preferred option of any particular organization, group, or individual participating on the panel. Footnotes are included where appropriate to address varying points of view on specific recommendations.

The subject of greatest debate was whether all remaining single-walled UST systems should be phased out based on an age or environmental sensitivity criterion. Many panel members supported this approach because of the apparent poor performance of leak detection systems, the relatively high leak rate threshold of monitoring equipment, the inability of single-walled systems to contain a release, evidence of poor installation workmanship on piping systems, the significance of age as a factor in determining likelihood of a release, and finally, the concerns about the impacts of MTBE on water resources.[2]

Some panel members were opposed to the phase-out approach, because we are just completing a ten-year upgrade/replacement program and the available information is inconclusive with respect to the post-1998 population. They felt more evidence is needed before recommending a new "upgrade" program. These members were concerned about any additional costs to the business if new capital improvements were required in the short term because there has not been enough time to amortize major costs recently incurred for upgrades. They felt that if further research shows that remaining non-secondarily contained UST systems should be replaced, the phase-out period should be long enough to reasonably allow past capital costs to be amortized, or financial assistance should be provided. On balance, the panel decided not to recommend immediate phase-out of remaining single-walled components until further research is completed.

1. Field-based research should be conducted to quantify the probability and environmental significance of releases from UST systems meeting the 1998 standards. The research should strive to identify the source and cause of releases, and any deficiencies in leak detection systems. It should include single-walled, double-walled, and hybrid UST systems, and should avoid bias toward known leaking systems by including a statistically valid sample of all operating UST systems. This work should also address the question of whether some MTBE occurrences in groundwater at retail petroleum facilities are the result of minor surface spills or other non-UST related activities. The research should be overseen by the SWRCB, and should be cooperatively funded by government and industry. Work should include peer review and should be completed within two years. The results of this research, combined with further in-depth analysis of the data collected by the panel, should be used by government and industry to develop appropriate

[2] Some panel members believe that a phase-out of MTBE could help to reduce the need for any future changes in UST standards.

changes in design, construction, monitoring, operation, or maintenance requirements for current and future UST systems.

2. Industry, in consultation with state and local government agencies, should establish UST installer, owner/operator, service technician and inspector training programs and best management practices for UST facilities. Training should emphasize operation of leak detection systems and response procedures to suspected releases.

3. The SWRCB should require by regulation that UST facility owner/operators, service technicians, installers, and inspectors meet minimum industry-established training standards and that facilities be operated in a manner consistent with industry-established best management practices. The SWRCB should implement an outreach campaign to educate small business owners/operators on the importance of this requirement.

4. The Contractor's State License Board (CSLB) should, in consultation with the SWRCB, industry and local government, review its requirements for UST system installation and removal contractors and make changes where appropriate to ensure contractors are properly qualified. The CSLB changes should require all contractors to complete industry-established UST system installation/removal training, with periodic refresher training as appropriate.

5. The SWRCB should adopt regulations to reduce fraud and false reporting by owners and operators and UST system inspection, testing, and service/repair companies and to establish effective enforcement procedures in cases involving fraud.

6. New fuel additives that may have a significant potential for environmental risk should be properly tested for UST system compatibility before they are introduced into the retail market.

7. Standards should be developed through a cooperative effort between government, the petroleum equipment industry, and nationally-recognized independent testing organizations to establish uniform criteria for material compatibility and permeability testing for conventional and oxygenated fuels. The standards should address environmental protection as well as safety concerns. Existing compatibility standards could be consolidated and expanded to include consistent criteria for swelling, physical property retention, and other compatibility measures. New standards and criteria for permeability would need to be developed. Results of material compatibility and permeability testing with conventional and oxygenated fuels should be made readily available to any interested party.

8. The SWRCB should, in consultation with industry and local government, adopt regulations to require that secondary containment components of all new UST systems, including under-dispenser and pump turbine containment, be tested

periodically to ensure they are capable of containing releases from the primary containment until the releases can be detected and cleaned up.[3]

9. The SWRCB should develop guidance immediately, in consultation with local agencies and industry, for local UST regulatory agencies regarding proper installation and inspection procedures for identified critical components.

10. The SWRCB should issue guidance immediately to local UST regulatory agencies clarifying that under existing statutes, all piping systems attached to a UST installed after July 1, 1987, must be fitted with under-dispenser containment, and that any deficient systems must be retrofitted as soon as possible, but not later than two years from date of this report.[4]

11. The SWRCB should review existing enforcement authority and procedures to determine if changes are needed to enable local agencies to take adequate enforcement action against owners and operators of non-compliant facilities.

[3] There was concern by some panel members that routine testing of secondary containment may be impractical for some components. One panel member suggested that testing requirements for secondary containment should be based on the relative risk posed by the individual equipment and take into account actual leak histories for each component.

[4] This was a major subject of discussion. Some panel members believed that dispenser pans should be required immediately at all UST facilities and others believed that the requirement should not be mandatory where the system was approved without pans at the time of installation. Other members believed that they should only be required at the time of major re-piping work or on the basis of site-specific environmental risk. On December 2, 1998, the Division of Clean Water Programs issued a letter addressing this subject.