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L.U.S.T.LINE

A Report On Federal & State Programs To Control Leaking Underground Storage Tanks

PART 1: To HRSC or Not? What a Great Question!

by Stephen Dyment and Thomas Kady

In 1985, during a USEPA groundwater training course, an instructor suggested to us that greater than 98 percent of contaminant mass may be found in less than two percent of the contaminated footprint. What an opportunity! In assessing and remediating sites over the subsequent 30 years, we have found that nothing reduces project costs and durations more than finding and attacking this "high mass/low volume" footprint (a.k.a. source area). It's the root cause of all problems. As consultants in the private sector we rarely had clients say "no" when told they could tackle 98 percent of their problem by focusing on two percent of their site. If they had any doubt, we would simply offer up any number of consultants who would gladly spend 98 percent of the client's money focusing on just two percent of the problem.

By comparison, in 1849, many pioneers staked their claim and panned for gold in the foothills of the Sierra Nevada's. While they eked out a living, others headed to the mountains and made fortunes mining the ore veins, from which all the nuggets and flakes in the streambed ultimately came. How much time and money is spent on LUST sites chasing micrograms in dilute plumes with monitoring wells, while pounds, gallons, or tons are sitting ready for the taking in the source area? Using High Resolution Site Characterization (HRSC) techniques and data visualization to rapidly evolve highly accurate and quantitative conceptual site models (CSMs), we often can successfully map out the "mother lode" at LUST sites in just one or two weeks for project costs less than $50k.

Over the last several decades we have been conducting research and providing technical support for the implementation of HRSC tools and strategies in USEPA's Superfund, RCRA,

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Photo courtesy of Columbia Technologies.

An example of a direct-push drilling rig coupled with a direct-sensing van during the process of conducting a real-time high-resolution site characterization. The small, versatile footprint of the units allows for easy maneuvering at sites. The clean direct-push drilling approach virtually eliminates costly waste-handling requirements."

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and Brownfields programs. Since the mid-2000s we have also supported the Office of Underground Storage Tanks (OUST) in providing training and technical support to states and tribes for the implementation of HRSC at LUST sites.

Despite significant advances in available tools and our own successes in the field of HRSC, some state and tribal LUST regulators remain unsure of the benefits or how to apply these tools and strategies cost-effectively at their sites. In a recent exchange with OUST management and technical staff one colleague posed this series of questions:

Q. *When does it make sense to do HRSC at a LUST site? Always? Sometimes? Never?*

A. *Given the importance of site characterization, it helps to know what you need to clean up a site and where a release is located, so "never" isn't the right answer. However, given the cost associated with conducting HRSC investigations and the fact that some LUST releases are detected quickly and can be relatively small, "always" isn't the best answer either.*

Q. *So, if it is "sometimes," then how does a regulator know when to use HRSC and when it may not be necessary?*

A. *To address these and similar questions we offer two* LUSTLine *articles to provide historical perspective, highlight currently available tools and strategies, present case studies, and delve into the economics and "return on investment" for increasing applications of HSRC tools and strategies at LUST sites.*

Pan for Gold Nuggets or Mine the Mother Lode?

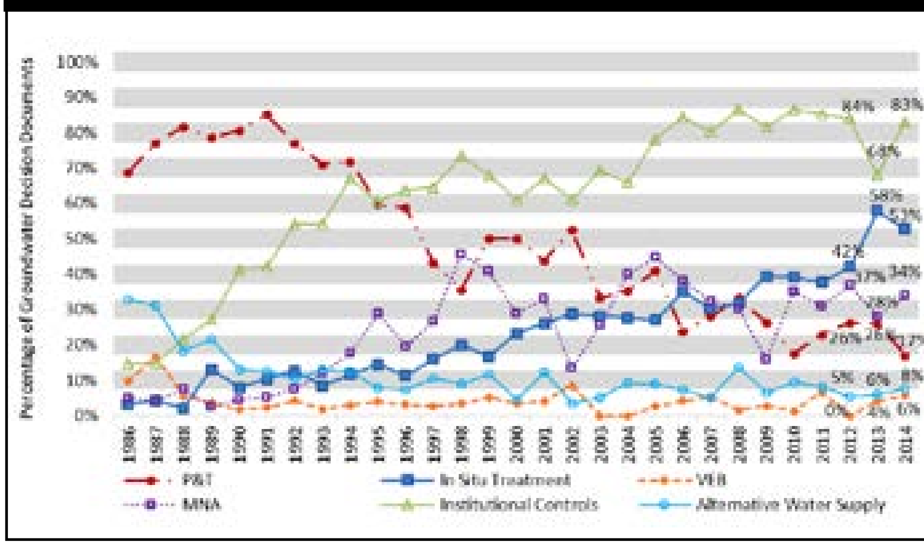
As one might imagine from two HRSC practitioners with decades of research and application experience, the answer to the question of when is HRSC necessary and useful would be a swift and resounding: ALWAYS! While we recognize that some petroleum releases can be detected quickly and may be relatively small, in the absence of HRSC data or direct quantitative evidence our experience tells us that we rarely address LUST sites with these conditions.

In fact, as site and release attributes move toward issues with non-aqueous-phase liquids (NAPL) or groundwater fate and transport off-site with potential human or ecological receptors, unknown contaminant mass/volumes, increasingly complex geology, and risks that present a need for mitigation/remediation, almost all sites will benefit from the application of HRSC tools and strategies.

So, like the pioneers in 1849, should the LUST regulatory and technical community continue to pan for gold nuggets or mine the mother lode? While the observation that 98 percent of contaminant mass can be found in two percent of the contaminated footprint may have been a generalization in 1985, subsequent research in HRSC and mass flux/mass discharge has continued to illustrate how profound this concept remains for those charged with characterizing and remediating contaminated sites.

For example, work published by Guilbault, Parker, and Cherry

FIGURE 1. Selection Trends for Decision Documents with Groundwater Remedies. (FY 1986-2014)



A transect of direct-sensing borings compared to recently installed monitoring wells across the boundary of a retail fueling station with a near-term release. The high-resolution information identified residual phase hydrocarbons trapped above a low permeability soil unit, several feet above the air-water interface. In contrast, the monitoring wells with extended screen intervals and associated filter packs provide ambiguous information regarding the pathways for the petroleum release and lack an actionable depth interval for hydrocarbon recovery. Additionally, the monitoring well installation likely provided a pathway to a deeper, more permeable interval of soil now contaminated with hydrocarbons. (Taken from Superfund Remedy Report 15th Edition, Figure 14. Office of Land and Emergency Management, July 2017, USEPA document EPA-542-R-17-001. *https://www.epa.gov/sites/production/files/2017-09/documents/100000349.pdf*)

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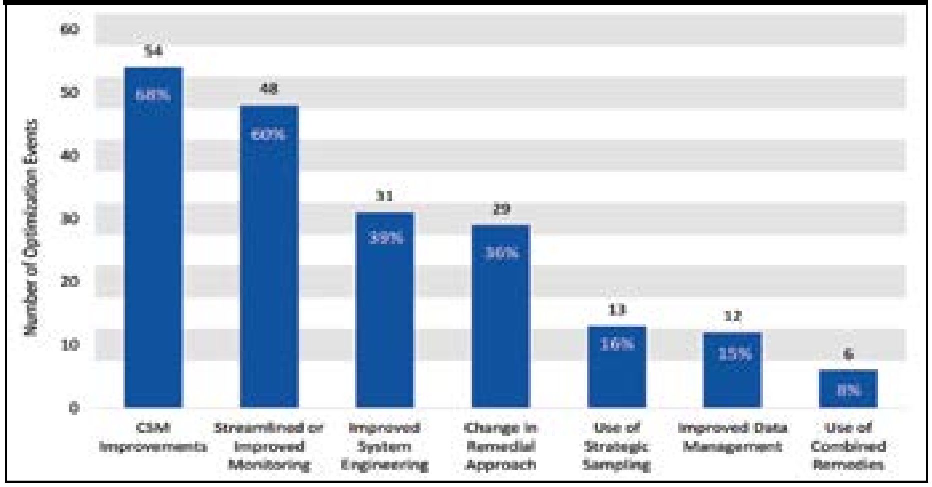
FIGURE 2. **Number of Implemented Tools and Techniques Total number of Optimization Events – 80**



onMass and Flux Distributions from Dense Non-Aqueous Phase Liquid (DNAPL) Zones in Sandy Aquifers in 2005[1] concluded that 75 percent of the mass was moving though five to ten percent of the cross sectional area in the aquifers evaluated.

Similarly, as the application of in-situ remediation approaches like in-situ chemical oxidation (ISCO), air sparging, and biological treatments have continued to rise, the need for HSRC tools and strategies has also increased. Figure 2, taken from the *Superfund Optimization Progress Report*[2] provides context in terms of the rates of technology applications in Superfund groundwater remedy decisions. During the period of 1986–2014, in-situ remediation approaches to address contaminated groundwater increased from no applications in the late 1980s to more than 50 percent of all superfund groundwater remedies in 2013 and 2014.

It is also clear from continued use of direct-sensing tools, such as membrane interface probe (MIP) and laser induced fluorsencence (LIF), that similar levels of complexity exist for light non-aqueous-phase liquids (LNAPLs) and dissolved-phase constituents commonly found at LUST sites. To illustrate the complexity often found at LNAPL sites, one need only revisit the 2011 *LUSTLine* #68 article "Where Is the LNAPL? How About Using LIF to Find It?"[3] Our experience at LUST sites, bulk terminals, refineries, and other petroleum-release sites follows closely several of the important article findings, including:

- "LIF evidence made it immediately obvious that LNAPL does not float on the top of the water table. In fact, it was clear that the majority mass of LNAPL was almost always situated in the pores below the water table. We realized this had profound implications for development of successful remediation strategies. By 2003, the PRP started requiring LIF data at many high-risk leak sites where aggressive remediation was necessary."
- "LIF data allowed us to confidently target remediation efforts on the LNAPL with almost surgical precision. At the same time, we groaned upon realizing that earlier soil excavations had often stopped at the water table while soil-vapor extraction would not have significantly affected submerged LNAPL. On the other hand, we realized why air sparging had, perhaps inadvertently to a degree, resulted in some notable successes."
- "Until we learned that LNAPL does not float on the water table, we assumed that free product would simply follow the water table gradient as it migrated away from the release point. LIF data showed us that this is rarely the case; rather, migrating LNAPL follows the path of least resistance above and below the water table… including opposite the hydraulic gradient."

Given the heterogeneous contaminant distributions and widely varying properties of aquifer materials commonly found at LUST sites, combined with increasing application of in-situ remediation approaches, regulators and technical experts in LUST programs would do well to consider opportunities to expand the use of HRSC tools and strategies in their LUST site portfolios.

Time Is of the Essence

While $50k may sound like a lot to spend in the first several weeks of a site investigation, it's nothing compared to the cost of delayed action. If after a release, the source is found while still in the vadose zone, remediation may cost just another $50k or so if action is taken quickly. But allow the release to reach the water table and create a smear zone, and cleanup costs just go up tenfold ($500k). Allow the smear-zone contamination to create a significant dissolved-phase plume, and cleanup could go up another four to ten times ($2M - $5M). Allow the dissolved-phase plume or NAPL to become a bedrock issue, and sometimes no amount of money can easily or rapidly solve the problem.

In our experience, and most would agree, it doesn't take much time for releases to morph into more and more complex problems. Why then are some regulators so bought into the excruciatingly slow pace of conventional assessment techniques? Because they save money? Hardly. Because of the precision of the data? Parts per billion are meaningless units when the root cause is free-phase product or saturated soils containing pounds, gallons, or tons of contaminants—not, micrograms. HRSC tools such as direct-sensing instruments read out in logarithmic scales, which is perfect when delineating areas that differ in concentration by several orders of magnitude.

There is a distinct advantage associated with using HSRC with real-time CSM refinement and data visualization tools. We've seen a significant reduction in document review/comment/finalization times associated with HRSC investigation deliverables. We also see improved

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response times from decision makers during investigation, remedial design, and remedy implementation activities.

This approach can require the additional attention of site managers and technical teams already juggling large-site portfolios. However, during the actual HRSC field investigation, distance collaboration and data visualization tools allow a near-real time team approach to data review/interpretation, data gap analysis, and decision-making.

The result is often that by the time a deliverable is provided for review to stakeholders, the technical team has agreed to most of the interpretation and conclusions from the data sets. Hence, subsequent discussions tend to focus on how to address the problem, not in arguing over sampling approaches, data density, and interpretation from HRSC investigations.

The Cost of Being Fooled

Almost without exception, direct-sensing HRSC techniques indicate that the "mother lode" of contamination is in a free-phase layer and/or adsorbed in a low-permeability soil layer. In either case, dissolved phase is not the root cause of the problem, but rather a symptom of the root cause. As soon as "monitoring" wells are used to "delineate" contamination, however, most people's mindset shifts toward the water as the problem. This mindset shift typically leads to extensive investigations (in the 2% mass area) at great time and expense, and often leads to ineffective remediation approaches at even greater time and expense (see Figure 3).

The heterogeneity of subsurface and aquifer materials commonly results in highly heterogeneous contaminant distributions. Therefore, when characterizing any site we prefer to have higher data density (even if less precise) in the horizontal and particularly in the vertical direction for contaminant location and hydrogeologic properties (e.g., hydraulic conductivity, porosity, grain size, soil).

Using transects perpendicular to groundwater flow as well as vertical profiling using multiple sensors "stacked" on direct-push tools allow investigators to cost effectively collect hundreds or thousands of data points versus just a few analytical samples and bore logs. These tools are rarely used alone, rather, they are used with collaborative data sets where HRSC outputs provide rapid CSM development to identify source areas, plume cores, and important hydrogeologic features, which allows for targeted soil and water sampling using traditional techniques. Geophysics, field-screening tools, mobile lab techniques, visual observations, standardized core descriptions, and other strategies offer additional lines of evidence that can support HRSC data sets.

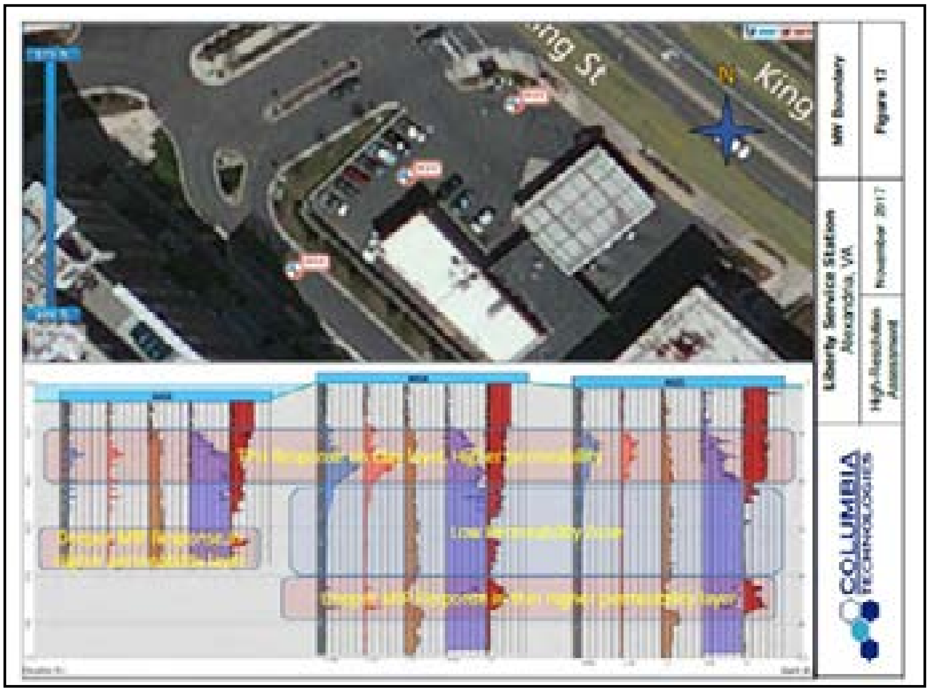

Photo courtesy of Columbia Technologies.

FIGURE 3. *A transect of direct-sensing borings compared to recently installed monitoring wells across the boundary of a retail fueling station with a near-term release. The high-resolution information identified residual phase hydrocarbons trapped above a low-permeability soil unit, several feet above the air-water interface. In contrast, the monitoring wells with extended screen intervals and associated filter packs provide ambiguous information regarding the pathways for the petroleum release and lack an actionable depth interval for hydrocarbon recovery. Additionally, the monitoring well installation likely provided a pathway to a deeper, more permeable interval of soil now contaminated with hydrocarbons.*

Well-screen placement, an important consideration for any monitoring-well program, can also be optimized based on high-density, direct-sensing tool outputs for contaminant distribution and localized aquifer material properties like hydraulic conductivity. This can significantly reduce the number of monitoring wells installed as part of a site investigation, optimize where wells are placed and screened, and avoid costly "poke and hope" characterization approaches where monitoring wells and lengthy screens are the primary investigative tools.

A downside to the sole use of conventional drilling and sampling techniques to identify a small, quickly detected and mitigated release is that you really don't know if your site is actually one of those rare and elusive LUST examples or if the low density of data and high uncertainty are just misleading you. Similarly, we have experienced many LUST sites where low data density and high uncertainty are not properly considered. The resulting CSM interpretation (if even completed) turns out to be highly inaccurate, leading to poorly performing or failed remedies.

This is hardly a problem unique to LUST sites. In fact, our experience with Superfund Optimization (*https://www.epa.gov/superfund/cleanup-optimization-superfund-sites*) over the last two decades indicates that more than 50 percent of sites and remedial systems reviewed include recommendations for additional characterization and CSM development. Characterization, CSM development, and use of HSRC tools and strategies, therefore, represent a significant portion of Superfund optimization recommendations and illustrate a continued opportunity to improve remedy design and implementation at many site types, including LUST sites.

The latest Superfund Optimization report (*https://semspub.epa.gov/work/HQ/196740.pdf*) includes an evaluation of 80 optimization events conducted between 2011-2015. Figure 2, page 3, from the report indicates the number of events and percentage of recommendations implemented by category. The top category includes recommendations for CSM improvements that were implemented at 68 percent of sites (54/80) while recommendations for changes to the monitoring programs followed closely at 60 percent (48/80). Sixteen percent of the sites (13/80) directly implemented recommendations for the use of strategic sampling, which includes HRSC at groundwater sites and incremental sampling techniques in soil and sediment media.

The cost of being fooled, in our experience, can be significant. For example, consultants from Arcadis have recently trademarked the term "return on investigation" as a means to quantify improvements in remedy performance and costs, compared to additional characterization costs derived from a HRSC effort. The Superfund optimization program, as well as the Air Force, Navy, and other agencies have attempted similar evaluations to quantify the benefits of using HRSC strategies as they apply to remediation expenditures. Estimates from these types of evaluations have indicated potential returns on money spent for HRSC investigations to reductions in cost and time for remedy implementation ranging from three to more than ten times return on money invested.

So, To HRSC or Not?

Obviously, each site has unique features, and many sites may be very far along the characterization/remediation continuum when we first learn of them, increasing site complexity and challenging our ability to effectively remediate those presenting unacceptable risks. Even so, where should LUST programs be spending money? On the portion of the site where only two percent of the contaminants reside or the portion where 98 percent reside? If you hope to identify the volume of material where most of the contaminant mass resides to improve risk decision making and remedy design/performance at your sites, only HRSC data sets offer the density necessary to make such an evaluation.

A downside to the sole use of conventional drilling and sampling techniques to identify a small, quickly detected and mitigated release is that you really don't know if your site is actually one of those rare and elusive LUST examples or if the low density of data and high uncertainty are just misleading you.

When considering the question of "To HRSC or not?" we suggest that you at least dip your toes into the expanding pool of HRSC tools and strategies. Consider combining some level of HRSC with traditional approaches at your LUST sites. In our experience, project teams that avoid using HRSC in early project stages end up paying a lot more in contrast to what incorporating some level of HRSC approaches and technologies would have cost them in the first place.

In the next issue of *LUSTLine*, we will discuss the cost issues in greater detail. We will also share information from LUST program managers in several states to gain a greater understanding of the uses and limitations of HRSC in their respective programs while highlighting opportunities for expanded use. ■

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Tom Kady is an engineer with the Office of Superfund Remediation and Technology Innovation (OSRTI) and a member of the Environmental Response Team (ERT) located in Edison, New Jersey.

Endnotes

1. Guilbeault, M. A., B. L. Parker, and J. A. Cherry. 2005. "Mass and Flux Distributions from DNAPL Zones in Sandy Aquifers," *Ground Water* 43(1): 70–86.
2. *Superfund Optimization Progress Report 2011-2015*. Office of Land and Emergency Management, June 2017, USEPA document EPA-542-R-17-002. *https://semspub.epa.gov/work/HQ/196740.pdf*
3. Stock, Paul. 2011. "Where's the LNAPL? How About Using LIF to Find It?," *LUSTLine* #68, p 13.

USEPA OUST Answers Some Lingering Sump Questions

In *LUSTline* Bulletin #83 (December 2017), Kevin Henderson asked a number of snaky questions relating to annual sump inspections in his article, "Watch Out for Them Snakes – Thoughts on Annual Containment-Sump Inspections." Kevin was especially concerned about sumps that were not serving a leak-detection role (e.g., do I have to repair a torn entry boot? If I repair it, do I then have to test it to be sure it is liquid tight?) USEPA has taken several of these questions to heart and has published answers in the online Technical Compendium for the 2015 regulations. Go to: *https://www.epa.gov/ust/underground-storage-tank-ust-technical-compendium-about-2015-ust-regulations* and click on the heading "Spill buckets, under dispenser containment sumps, containment sumps." ■

Wander LUST
a walkabout with Jeff Kuhn...

Jeff Kuhn recently retired from a career in environmental cleanup with the Montana Department of Environmental Quality (MDEQ) and plans to forge on as a private consultant. He is a veteran at the state and national level having tackled almost every technical issue that has arisen in petroleum remediation in the last 30 years. Through this column he takes us on "walkabouts" across the fascinating world of underground storage tanks. Jeff welcomes your comments and suggestions and can be reached at jkuhn@bresnan.net.

The Real Site-Assessment Question
Changing Horses in Midstream

A number of years ago I was struggling to solve a complex cleanup site and had already reached a number of conclusions… conclusions with the potential for expensive cleanup options. Fortunately, a friend stopped me cold when she asked, "What is the real question?" I had to stop and think. I was already formulating a nicely packaged remediation solution and was calculating the budget before I even understood the real problem. I was trusting in my instincts and was convinced that I was right. And like many state regulators, I had far too many other sites to address to dwell on the possibility that my conclusions were based on insufficient data and could be wrong. And even worse, I didn't want to be seen "changing horses in midstream."

If you look up the idiom, you'll find the lyrics to Dan Fogelberg's famous song with a similar title. Then you'll find definitions of the idiom and all the reasons why it's not advisable to change those horses in mid-stream. Apparently, even Abraham Lincoln advised against it during his Presidential Campaign in 1864. But here's my challenge to you: don't be afraid to change horses in mid-stream. But do it for good reason! And here's why…

Why Sell an Incomplete Data Set?

Many new project managers are quickly overwhelmed by the sheer volume of work in front of them. As scientists and engineers, we pride ourselves on problem solving. However, the ticking of the clock and budgetary realities almost always thwart our idealism. From my own experience, and that of other colleagues, I would say, in general, that environmental cleanup projects are universally driven by short deadlines and limited budgets. There is seldom the luxury of time and money to develop a conclusive data set that might allow a project manager to sleep better at night.

As a result, most project managers quickly learn how difficult it is to manage a project with a limited number of data points. Regulators and consultants can easily fall into the trap of combining their intuition, experience, and "gut-level feel" with this very limited project data set. I would even state that it becomes the "norm" and is routine.

Regardless of whether you are a regulator or a consultant, all state program rules were developed after federal rules provided specific deadlines for completion of site assessment, cleanup activities, and submission of reports. Environmental cleanups are deadline-driven. So, unless you're conducting an academic research project with a hefty budget and a generous time-line, you cannot collect enough project data in the given time to reach an accurate conclusion about subsurface contaminant fate and transport.

We try to reach the highest level of certainty in our conclusions with the least amount of data—sometimes against all logic. But what if we're wrong? Would it not have been wiser to step back and consider changing directions when our gut told us something was amiss? It's important to remember that all states allow extensions of deadlines due to extenuating circumstances. Project managers should use that latitude when appropriate.

In practice, Phase II site assessments often lead to numerous subsequent phases of assessment as we try to gather additional data that will lead to the correct choice for the best available technology—the "perfect fit" for the remediation option that gets the job done. And it should all work out wonderfully and remain within project timelines and budget constraints. But I seldom experienced that as a regulator.

Remember that site assessment is not the end-game of data collection. When site assessment results in remedial action selection, additional data will be generated as the chosen remedial option is implemented. It is critical to evaluate the conceptual site model in light of this new data. In a worst-case scenario the new data may suggest that the chosen remediation strategy is inappropriate or needs major modification. It is better to redirect at this point than continue to throw money and time down a rabbit hole in the name of moving a site forward. I have learned that project management is not the "simple" task of moving a site across the stream from site investigation to site remediation. In fact, it is rarely a simple stream crossing for me or my staff.

Most of the "stream crossings" we encountered in managing remediation projects involved multiple branches at flood stage, bad weather, wild unbroken horses, and tired, downtrodden cowboys just trying to stay in the saddle to keep from drowning. The day-to-day job of keeping the project moving forward is always much harder than just doing the science!

Closing Unassessed Sites

Due to huge project backlogs, states are tempted to close sites with minimal assessment. I have two words for this approach—BIG MISTAKE. Why, in the absence of data, would we consider closing an unassessed site? Of course, we need to balance site assessment costs against budget mandates. Clearly, there is a limit to the number of projects we can fund at any point in time.

In the early 1990s, state fund managers watched as several states with no cost controls ran amuck and bankrupted their state funds. As a result, most states implemented a variety of cost-control tools, including Risk Based Corrective Action (RBCA) and priority ranking systems, to focus efforts on the highest priority sites and communicate spending decisions. This was good. Unfortunately, in some instances, this also led to some inventories of unassessed sites in many states. This was bad.

USEPA's Backlog Study (2011) thoroughly discussed this problem and proposed some alternatives and solutions. Closing a site with inadequate assessment is asking the regulator to use a crystal ball to predict the outcome. It essentially thrusts the environmental liability on to future landowners and adjacent property owners who have no reason to suspect there may be a problem. Why risk it? (Note: There is and always has been intense pressure in many states to close sites with little or no assessment. While that may include overfills and spills, it more often refers to old sites that were never assessed because nothing was on fire or threatening to explode.)

Doing It Right

In the mid-1980s, during my tenure with an environmental consulting firm in the mid-west, we hired Fletcher Driscoll, author of *Groundwater and Wells*, to hone our report writing and review skills. Later, in my position with the Montana DEQ, I called Fletcher and asked him to come to Montana and conduct a short course on report review and geologic data interpretation. It was a real eye-opener for many new staff members fresh from college and graduate school.

Fletcher had completed his PhD work on glacio-fluvial stratigraphy in the Yukon and emphasized a clear approach for understanding depositional environments. His training was a powerful lesson on the importance of gathering sufficient geologic data to properly understand a site. Correctly interpreting borehole data and understanding groundwater flow based on depositional environments resonated with my staff. That training was especially important in a state where glacial geology is commonly encountered.

Fletcher's approach was mirrored by a host of other good scientists and was later developed and formalized into the Conceptual Site Model, or CSM (*www.itrcweb.org/ism-1/3_1_2_Conceptual_Site_Models.html*). The importance of CSM guidance cannot be overemphasized. There are many tools available that provide both the logical steps and examples of how do it. Sometimes our intuitions and gut feelings prove to be correct. Gross generalizations about local and regional hydrostratigraphy and contaminant flow, are in some cases, predictable. However, a better and more defensible approach is to trust the scientific method and not shrink back from collecting a sufficient amount of data to build a solid CSM.

Does this cost additional money? Yes. And state and federal programs that provide the funding for these projects need to remember that seldom are two sites the same—all are unique. There is no "cookie-cutter" approach that can be neatly monetized. State funds have come a long way in providing alternatives that allow a tailored project approach. But there is still much room for improvement.

Updating the CSM with new data may prevent project managers from going from horse to horse, taking educated guesses while ignoring the critical analysis of available data, or worse, failing to recognize important data gaps that could lead to very costly mistakes. We all know use of a CSM is the correct approach…but are we really doing it?

Advanced Site Characterization Tools

When I began conducting site assessments our tools were primitive. Soil borings and groundwater monitoring wells were almost exclusively used to create a data set. As other tools became available, our ability to accurately interpret the subsurface has increased. The ITRC Advanced Site Characterization Tools Team is currently mapping out assessment strategies using these new technologies (*https://www.itrcweb.org/Team/Public?teamID=79*).

These new tools continue to increase the quantity and quality of our assessment data and are leading to a much higher remediation success ratio than we've ever seen before.

That Stream Crossing

My advice can be summed up in the following themes:

- Use all the available assessment tools and technologies appropriate for site conditions. If an advanced site-

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■ **The Real Assessment Question**
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characterization tool can be deployed at your site, use it.

- Develop an accurate CSM. Give your CSM to a colleague and ask him/her to review it mercilessly—we all need healthy and constructive criticism. Critically review the data, consider the comments of colleagues, make necessary adjustments, and look for important data gaps. Listen to all of the experts available to you. Early in my career I discovered that some of my best information came from local residents, water well drillers, municipal department contacts, and excavation contractors.
- Don't be afraid to "change horses in midstream." Be willing to modify your CSM as new data comes in. Be bold! Modify your proposal and budget mid-stream if you need to. Money well spent now is money saved later. I was never disappointed in those that did so. I was deeply chagrined at those who ignored their data or drew conclusions from limited data points spread over a large area. Being wrong is expensive.
- Make sure you've chosen the right horse, and then move forward with confidence using an appropriate remediation alternative. A complete data set and well-constructed CSM will save a tremendous amount of time and energy in the approval process.

In closing, I want to acknowledge that I've been wrong about my own data-driven conclusions many times. But I was fortunate to have a few sites where I could conduct more detailed research with a healthy budget over a longer timeframe. Those slower moving sites were incredibly informative and allowed me to more accurately assess the hundreds of smaller, rapidly moving sites with very limited funding. Perspective is everything; grab it and learn from it whenever you can. And never be afraid to change horses in midstream! ■

At Last!

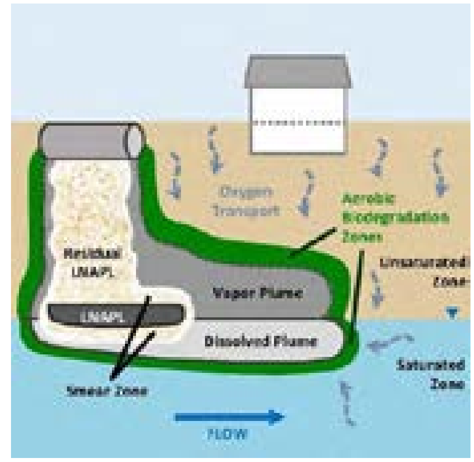
USEPA's PVIScreen Hits the Website

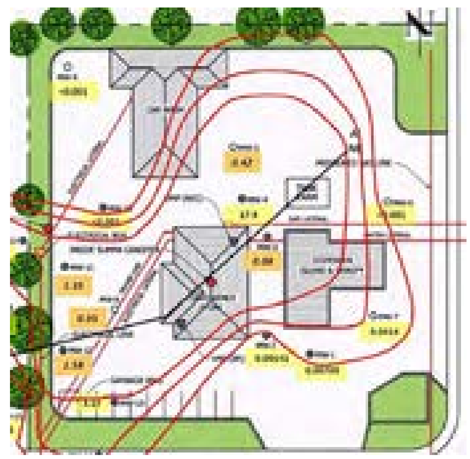
In April 2018, USEPA/ORD released the long-anticipated PVIScreen model developed by Jim Weaver. The model promises to be a useful tool that state UST programs can use to appropriately prioritize resources to sites where petroleum vapor intrusion (PVI) may threaten human health. Models offer good ways to integrate and better understand the dynamics of PVI, but their use has been hampered by limited site-specific data. USEPA's PVIScreen addresses this limitation by treating the model results as one line of evidence for PVI and by incorporating an uncertainty analysis within the model. It is compatible with USEPA guidance for assessing PVI at leaking underground storage tank sites.

PVIScreen extends the concepts of a prior model (BioVapor), which accounted for oxygen-driven biodegradation of multiple constituents of petroleum in the soil above the water table. It was tested against the BioVapor code and applied to case examples in Utah and Oklahoma. Model simulations are in agreement with USEPA's Petroleum Vapor Intrusion Database, which contains field data that illustrate and document the attenuation of concentrations of petroleum compounds in soil gas with distance above the source of the vapors.

PVIScreen automatically conducts an uncertainty analysis, which repeatedly runs the model with differing values of site-specific factors. Some of these factors may be uncertain, while others are known. For example, while the ceiling height of the building is likely to be known, the exact depth of the petroleum source might be unknown and could be treated within a range of values. Typically, the model is run 1,000 times using these various factors and input quantities.

Through this process, the model makes uncertainty analysis practical, as running the model individually for all the possibilities would





be cumbersome. The model's documentation provides descriptions of the basis of the approach, along with required inputs, example problems, and the theoretical background of the model.

PVIScreen and an accompanying user guide may be downloaded from ORD's website at: *https://www.epa.gov/land-research/pviscreen*

See *LUSTLine* #82 for an in-depth article on PVIScreen by Jim Weaver and Robin Davis. For those of you who will be attending the National Tanks Conference this September in Louisville, Kentucky, Jim Weaver will be conducting a half-day workshop on the use of PVIScreen. He will also make himself available throughout the conference. This may be your last chance to meet with Jim as he officially retired from USEPA at the end of April. We wish you well, Jim. ■

A Message from Carolyn Hoskinson

Director, USEPA's Office of Underground Storage Tanks

Natural Disasters Affect Us and USTs

Be Prepared! *It's the Boy Scout motto. As Scoutmaster of our local Boy Scout Troop, I know firsthand that preparation can make the difference between a fun time and a horrible experience. As we headed out on a recent campout, when the forecast called for steady soaking rain the entire time, we made sure we all had sturdy waterproof boots, rain coats, rain pants, and lots of tarps. Turns out we had a blast—albeit a very muddy and wet blast—but a blast nonetheless! Preparation is important for those of us in the underground storage tank (UST) world as well. When UST owners hear that natural disasters are looming, they should ready their UST facilities against the effects of natural disasters.*

In the 12 years I've been with the UST program, numerous natural disasters have affected communities and UST facilities across our country. I commend state and territorial UST programs because you have done a great deal to help your UST owners and operators prepare before natural disasters hit and then tackle necessary assessment and cleanup work after the immediate disasters are over. Thank you for that and keep up the good work.

Past LUSTLine *articles have talked about storm events. But the severe weather of autumn 2017 made me think it is worthwhile to share information about more recent natural disasters, as well as some from a while ago.*

Natural disasters—hurricanes, wild fires, earthquakes, volcanic eruptions, to name a few—are often unpredictable and can cause significant damage. Below I talk about some natural disasters that have and/or potentially could have affected UST facilities, give you an update on how we helped states, share a few lessons learned, and discuss how we can prepare for future natural disasters.

Mother Nature's Effect on Our Communities and Our UST World

Just recently, PBS NewsHour aired this interesting graphic listing the five costliest hurricanes in United States history.

1. **Katrina – $160 billion**
2. **Harvey – $125 billion**
3. **Maria – $90 billion**
4. **Sandy – $70 billion**
5. **Irma – $50 billion**

Do those named hurricanes sound familiar? They are familiar to me and the UST program, because for all of them Congress appropriated supplemental Leaking Underground Storage Tank (LUST) Trust Fund money to states for UST assessment and remediation. Below are some tidbits about those hurricanes and a couple other natural disasters that took place between 2005 to 2017.

In less than a one-month span in autumn 2017, three category 4 hurricanes made landfall in the United States. Hurricanes Harvey, Irma, and Maria caused deaths, damage to homes, and outages of basic services in Gulf Coast states and U.S. territories in the Caribbean. In some instances, flooding water and high winds impacted UST systems in those states and territories. These hurricanes caused billions of dollars in damage, and the effects from the hurricanes' wind, rain, and flooding continue to plague impacted areas.

California's 2017 wildfire season goes down as one of the worst in the state's history, because of unusual late-season activities and multiple record-shattering blazes. From January to December 2017, over 9,000 fires burned more than 1.2 million acres in California, including nearly 300,000 acres burned solely by the Thomas Fire in southern California, which in late December grew to be the largest wildfire in the state's history (until the fires this year topped it). The blazes damaged critical infrastructure and forced evacuations.

Hearing about a lava flow threatening an UST facility caught my attention. In December 2014, a lava flow was predicted to reach a gas station in Pahoa on the big island of Hawaii. Even though the gas station owner prepared for the coming lava, it fortunately stalled before reaching the town. This kind of slow moving disaster can allow ample time for preparation. This year, lava is again flowing from Kilauea, threatening communities on Hawaii, and prompting preparation.

In October 2012, Hurricane Sandy made landfall near Atlantic City, New Jersey. The storm surge was amplified because it took place during high tide along the Atlantic Coast. The hurricane affected coastal regions from New Jersey north to Connecticut, including New York City and Long Island, exacerbating the large amounts of rain that significantly impacted people. The winds disrupted electricity for millions of people in 15 states. Residences, businesses, streets, tunnels, subway stations, electrical systems, and more were flooded, and airlines cancelled more than 15,000 flights. Most gas stations in New York City and New Jersey were closed because of power shortages and depleted fuel supplies. Long lines formed at gas stations that were expected to open.

■ *continued on page 10*

A Message from Carolyn Hoskinson ...continued from page 9

Another trio of hurricanes—Katrina, Rita, and Wilma—punished the southeastern United States, this time in 2005. In late August, Katrina brought hurricane conditions to southeastern Louisiana, southern Mississippi, and southwestern Alabama. The resulting levee breaches in New Orleans led to massive flooding. That year, in September, Rita provided a second punch to portions of southwestern Louisiana, devastated portions of southeastern Texas and southwestern Louisiana, and significantly impacted the Florida Keys. In October, Wilma made landfall over southern Florida after making landfall in Mexico a few days earlier.

Over the years, there have been numerous other notable storms and natural disasters with major impacts on communities, including UST facilities. Two in particular come to mind: Matthew in 2016 and Irene in 2011. Some communities near bodies of water have experienced flooding unrelated to hurricanes. For example, floods have impacted and challenged communities and damaged UST facilities along the Mississippi River.

Since any number of communities and their local UST facilities will inevitability continue to experience severe storms and flooding in the future, the question of how to prepare is an essential one.

USEPA Helps State UST Programs Affected by Severe Hurricane Damage

The UST program has been fortunate to receive money for states affected by the 2017 trio of Harvey, Irma, and Maria; Sandy of 2012; and Katrina and Rita of 2005. As a result of those storms, Congress authorized supplemental money from the LUST Trust Fund to help with assessing and remediating USTs in states affected by hurricane damage.

To address the damage at UST facilities from Harvey, Irma, and Maria, Congress in 2017 set aside a supplement of $7 million of LUST Trust Fund money to give grants to states affected by those three hurricanes. USEPA developed grant guidance and will soon distribute the money to Texas, Louisiana, Puerto Rico, and the U.S. Virgin Islands. As yet I can't provide you with specifics about the number of assessments or remediations completed. But I am certain these supplemental funds will help UST facilities address the effects from these three hurricanes.

In 2013, Congress responded to the devastation from Hurricane Sandy by providing $4.75 million of supplemental money from the LUST Trust Fund for UST facilities affected by that hurricane. New York and New Jersey shared that money and were able to complete 13 UST assessments and 7 UST cleanups.

In 2006, Congress allocated $15 million of supplemental money from the LUST Trust Fund for USEPA to give grants to states for assessing and remediating UST facilities affected by Katrina and Rita. This money played a critical role in allowing Louisiana, Alabama, and Mississippi to assess and clean up hundreds of UST facilities damaged by the hurricanes. Specifically, Alabama assessed and remediated 10 sites; Mississippi identified 124 confirmed releases and completed 106 cleanups; and Louisiana identified and cleaned up approximately 150 releases.

In addition to providing money, USEPA helps communities affected by natural disasters in other ways. USEPA's Office of Land and Emergency Management, or OLEM, the parent office under which the UST program resides, is responsible for emergency responses—along with other situations. USEPA staff from around the country, including UST staff, have volunteered to help with emergency response efforts, bringing needed technical and logistics support to impacted states and communities.

Lessons Learned

Over the history of the UST program and in dealing with natural disasters, we've learned the following things about the impacts of severe weather on UST facilities:

- Flooding causes major damage to UST facilities.
- While dispensers and canopies often suffer the most damage, we also see damaged piping, failed sheer valves, displaced fuel due to water entering tanks, and some floating tanks.
- Existing remediation sites can be impacted by damage to onsite remediation equipment and changes to subsurface plume configuration, requiring additional assessment and potentially modified remediation approaches.
- Floating debris is the source of a lot of physical damage to facilities.
- Electrical shutdowns and shorts reduce an UST facility's ability to operate.
- Transportation difficulties make it hard to reach facilities to inspect, test, and repair them.

Preparation Is Key

Benjamin Franklin's adage, "By failing to prepare, you are preparing to fail" rings true for UST owners as well as Boy Scouts. We all agree we will experience future natural disasters that impact our communities and UST facilities. Most times, early warning systems are in place to alert us that dangers are coming. Those early warnings allow time to prepare for impacts from natural disasters.

Here are a few resources USEPA and states have developed to help UST owners and operators prepare for and respond to the devastating effects from floods and other natural disasters.

■ USEPA's *Underground Storage Tank Flood Guide,* available on USEPA's website *https://www.epa.gov/ust/underground-storage-tank-flood-guide,* provides simple guidelines and useful information for state, local, and tribal authorities in the event of a threatened or actual flood. It provides information

A Message from Carolyn Hoskinson ...continued from page 10

about preparing for a flood, important actions after the disaster strikes, and information on financial assistance. The guide gives information about how to return impacted UST systems to service as soon as possible.

- USEPA's Natural Disasters and Underground Storage Tanks web page *https://www.epa.gov/ust/natural-disasters-and-underground-storage-tanks* provides practical resources to help states and UST owners and operators prepare for, prevent, or lessen catastrophic effects and environmental harm from natural disasters. Our Post Severe Weather Checklist, which we developed in response to states' requests, is available on this web page.
- Louisiana's Department of Natural Resources, in conjunction with UST owners, marketers, and trade groups, developed a plan to ensure that UST facilities located along evacuation routes have fuel available for evacuees. You can access the Louisiana Fuel Team and Playbook web page *http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=786* for more information.

Onward

Given that we will continue to experience natural disasters—hurricanes, floods, wildfires, earthquakes, and more—we need to heed warnings of impending weather or natural disasters. Then we can do our best to prepare and protect our families, and we can help UST owners and operators prepare for disasters, do what is necessary to recover from them, and return UST facilities to safe operating condition. ■

Examples of Hurricane Impacts at UST Facilities

(Photos from Hurricane Katrina, courtesy of Kevin Henderson, formerly of Mississippi Department of Environmental Quality)

Gas stations can be severely damaged.

Tanks can buckle due to backfill being washed away.

Dispensers and piping can be damaged or destroyed.

Sometimes contamination is visible, other times it is not.

Tank-nically Speaking

by Marcel Moreau

*Marcel Moreau is a nationally recognized petroleum storage specialist whose column, **Tank-nically Speaking**, is a regular feature of* LUSTLine. *As always, we welcome your comments and questions. If there are technical issues that you would like to have Marcel discuss, let him know at* **marcel.moreau@juno.com.**

From Wooden Sticks to Big Data

An UST Odyssey

In the early days of my UST career, visits to gas stations almost invariably included noting at least one, and usually several, old wooden gauge sticks, often at the back of the station lying on the ground. Typically, there were a few broken ones, a very worn, illegible one or two, and occasionally, one gauge stick in reasonably good shape. The smallest calibration marks on even the best gauge sticks were one-quarter inch. Eighth-inch markings on gauge sticks did not appear until after the federal rule requirement to keep inventory with eighth inch accuracy. In the 1980s, wooden sticks were the dominant, and for practical purposes, the only way to tell how much fuel was in an underground storage tank.

A few other ways of measuring fuel volume in an underground tank had been tried. In the 1970s, Shell Oil Company had experimented with aluminum gauge sticks. This was apparently an effort to improve the measurement accuracy of wooden sticks by minimizing the effects of "creep." Creep was an issue with wooden sticks, especially older ones that had lost their coating of varnish, where the fuel would wick up the wooden fibers and indicate a liquid level that was higher than the actual liquid level. But aluminum sticks were quite a bit heavier than wooden sticks and soon began causing damage, especially to early fiberglass tanks. So aluminum sticks made only a brief appearance on the UST scene.

There were devices that consisted of a flexible tape with inch markings (much like the ones in today's retractable tape measures) that were draped around a pulley mounted just beneath a circular viewing port at the top of a tank riser. A float was attached to one end of the tape and a small weight on the other. The float end of the tape floated on the fuel, and as the fuel level went up and down the reading that showed through the window at the top of the riser indicated the depth of fuel in the tank.

If properly calibrated, these tape gauges had the potential for improved measurement accuracy over sticks, for they had markings that were as small as a sixteenth of an inch. But in fact, the viewing port at the top of the riser through which the readings were made had a tendency to get fogged with moisture, making it hard to read the tape accurately. Even when the window was not fogged, you still had to remove a grade-level cover, get down on your knees, and peer closely through the glass to read the tape accurately. In the end, this device proved to not be very user friendly.

In the heating oil arena there were pneumatic gauges that involved pumping air through a copper tube that extended from a remote gauge, often in a building basement, to near the bottom of the tank. A small manual pump was used to pump air through the tube until the air exited the bottom of the tube inside the tank. Once the copper tube was evacuated of fuel and the pumping was stopped, the fuel in the tank would reenter the copper tube, compressing the air within it somewhat, with the amount of compression proportional to the depth of liquid in the tank. The increase in the air pressure in the tube moved a gauge mechanism that was usually calibrated in gallons and thus gave an estimate of how much fuel was left. These devices never made it to the gasoline world, perhaps because they were not accurate enough for inventory control purposes.

The ATG Marriages

But while wooden sticks ruled the 1980s, there were a number of companies beginning to work on ways to remotely gauge a tank. A number of probe technologies came and went before magnetostrictive technology came to dominate the scene. Remote tank gauges were certainly more convenient than going out into the dark or cold or rain to gauge a tank with a wooden stick, but they were usually viewed as little more than glorified (and expensive) sticks.

The Marriage of ATGs and Leak Detection

But the 1980s were also the era of fairly frenetic activity in the leak detection world, especially in the realm of tank testing. There were numerous entrepreneurs who envisioned making their fortune by inventing the "perfect" tank test in the years just prior to the publication of the federal rule in 1988. The goal was to develop a tank test that would be quick, easy, and didn't interfere with station operations too much.

A clever engineer noticed that there was potential for these automated gauges to serve as tank-testing devices, for they could monitor fuel levels in a tank during quiet periods and determine whether any fuel was being lost. Though they were not likely to be as accurate as a tank-tightness test, they had the advantage of being permanently installed and did not require a skilled operator, so tests could be run on a much more frequent basis. They did not test the entire tank as most "overfill" tank-tightness tests of the time did, but the USEPA rules blessed this "underfill" approach to tank testing by stating that tightness tests only needed to test that portion of the tank that routinely held product to be acceptable as leak detection.

The Brief Early Marriage of ATGs and Inventory Control

And so tank gauges made their way into the federal rule as leak-detection devices, though the wording in the federal rule also linked them to inventory control. I suspect this happened because some tank-gauge manufacturers, or perhaps their marketing departments, advertised tank gauges as being able to conduct "automatic" inventory control.

As the 1990s progressed, ATGs became increasingly popular. In my view, this was because they were the only form of leak detection that also provided some business benefit to tank owners and operators. It was pretty widely recognized in the industry that the accuracy of inventory-control data obtained with a stick left much to be desired.

Fuel inventory requires knowing the volume of fuel in the tank, the volume delivered, and the volume sold. Tank gauges could measure the volume of fuel in a tank and calculate an estimate of delivery volume by automatically noting fuel levels before and after a delivery, but communication with point-of-sale (POS) systems to obtain sales data would prove to be a much more challenging task. It would take another 15 years of development before truly automated inventory control would become a reality.

The USEPA soon walked back the language linking ATGs to inventory in its 1988 rule. The agency stated in a letter that tank gauges that had achieved certification of being able to detect leaks of 0.2 gallons per hour with 95 percent probability of detection or better could be used as stand-alone leak detection without inventory control.[1]

1. Letter from Jim McCormick, EPA Director of Policy and Standards Division, to Sarah Compton, McDermott, Will & Emery, April 18, 1989.

Although inventory and ATG leak detection were thenceforth divorced from one another, inventory control requirements are still linked to ATGs in the federal rule, even after the 2015 rule revisions.

ATGs Mature

Capabilities of tank gauges expanded greatly in the 1990s. For example:

- As secondary containment began to catch on with tank owners, tank-gauge manufacturers were quick to incorporate interstitial sensor-monitoring capabilities into tank-gauge consoles. Soon tank gauges were able to monitor most any sensor that could be produced. So ATGs became multipurpose tools that could add convenient inventory monitoring to many different forms of leak detection.
- Electronic line-leak detectors first appeared on the UST market as stand-alone units, but soon became assimilated into tank-gauge consoles. Tank gauges could now monitor not only tanks but piping as well.

ATGs Learn to Communicate

As the 1990s progressed, ATGs became increasingly popular. In my view, this was because they were the only form of leak detection that also provided some business benefit to tank owners and operators. It was pretty widely recognized in the industry that the accuracy of inventory-control data obtained with a stick left much to be desired. If fuel dispatchers who scheduled deliveries could have better information about how much fuel was in a tank, they could do a better job of getting fuel to a site before the site ran out of fuel.

ATGs developed remote communication abilities in the 1990s that made it possible for fuel dispatchers who schedule deliveries to get accurate, real-time measurements of how much fuel was in a faraway tank from the comfort of their desk. Fuel dispatchers' lives became considerably easier when it became possible to access the volume of fuel in the tank in real time from a remote location.

Communication capabilities increased dramatically as the inter-

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■ **Tanknically Speaking**
from page 13

net came of age and ATGs joined the information superhighway. Remote-monitoring services were born and it became possible to outsource leak-detection responsibilities to third parties. UST data was now accessible from anywhere in the world at any time.

The Marriage of POS and ATG

As the century turned, forward-thinking entrepreneurs began to think about how ATGs could be used to further improve inventory control. The key was marrying the information from POS systems to the accurate measurements of fuel level provided by ATG probes. This required improvements on several fronts, including dramatically improving the calculation of fuel volume from fuel level, carefully evaluating the noisy data generated by an active tank system, and conducting myriad complex calculations in real time. But the availability of high-powered computers and the development of sophisticated software made the dream of truly automated inventory possible.

The goal of this "continual reconciliation" technology was not so much leak detection as vastly improved fuel-management capabilities. For high-volume UST operations dispensing oceans of fuel in multitudes of tiny transactions, fuel inventory accuracy and accountability became very important. Tank owners could now spot overly generous dispenser meters, leaks, and theft almost in real time. Fuel inventory management reached levels of accuracy that marketers in the 1980s had never dared dreamed about.

Trouble in Paradise

Yet through all of these marriages ran a disturbing thread. While ATGs acquired more and more monitoring abilities, they also became the source of more and more alarms. A complaint that ran uniformly through the regulatory community was that UST owner/operators more often than not simply ignored ATG alarm messages, whether they indicated an irritating lack of paper or an ominous possibility of a leak. Operator training was born in hopes of addressing this issue (among others), but success has been limited. Why?

Enter the Wolves

The problem stems not just from operator obstinacy. It stems in large measure from the sheer number of alarm messages produced by ATGs. ATGs, it seems, have a habit of crying wolf. A recent study by a third-party ATG monitoring company revealed that in a sample population of 304 UST sites with 898 tanks, 42,056 alarms sounded over a six-month period. Once paper out, low-product level, and other operational alarms were removed, there were 32,927 compliance-related alarms (e.g., sensor fuel alarm, sudden loss alarm, gross test fail).

Is it any wonder that UST owner/operators get inured to ATG alarms? Is there an answer? It seems to me that a partial answer would be to have different alarm sounds for different types of alarms, but since the audible aspect of alarms is usually quickly silenced, it seems like this would have limited usefulness.

> ***Though I haven't a clue of the algorithms involved, I can see where if you had sufficient data relevant to a particular area of interest, you could use a computer to make some pretty valid predictions or come to some deeper understanding of a situation. What if this approach were applied to ATG alarms?***

ATGs in the Era of Big Data

But think about this. In the world at large, we are entering the age of "big data," where huge data bases of incredibly detailed information can be cross referenced and "mined" for information about specific individuals and their preferred behaviors. For example, I subscribe to a streaming music service that continually makes fresh recommendations to me about music that I should like.

Though skeptical at first, I have since come to accept that the recommendations are virtually always accurate. Though I haven't a clue of the algorithms involved, I can see where if you had sufficient data relevant to a particular area of interest, you could use a computer to make some pretty valid predictions or come to some deeper understanding of a situation. What if this approach were applied to ATG alarms?

Sorting the Howls from the Leaks

What if a computer armed with facility-specific data about the equipment that was present and operating characteristics could track all the alarms generated at a specific facility? What if the computer also had access to weather data and perhaps traffic data or other potentially relevant databases? What if the computer then learned how a specific UST facility "behaved?"

For example, what if the data showed that after a significant rain event, a "fuel alarm" routinely sounded for the regular submersible pump sump at facility XYZ? The computer would know that this is a non-discriminating sensor, so the fuel alarm could mean there is either water or fuel in the sump. Past service calls to the site inform the computer that the problem is water. In the future, fuel alarms for this sump closely associated in time with a rain event could be flagged as "water removal needed" rather than "leak response." On the other hand, a fuel alarm for this sump that sounded without being associated with a rain event could be flagged as a high priority leak alarm.

ATGs and UST Maintenance Budgets

What if periodically the computer could produce reports documenting service costs associated with responses to specific alarms associated with specific components at specific facilities sorted by highest to lowest cost? Perhaps the owner would decide that it was time to fix the water entry problem into the submersible pump sump at facility XYZ because it would be cheaper than paying the repeated water removal costs.

What if big data concepts were applied to UST ATG alarms so that truly high-priority leak alarms were identified and separated from

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The RISK Factor | by Patrick Rounds

Patrick Rounds is president of an Iowa-based insurance company that provides insurance for owners of petroleum USTs. The company was created by and is owned by UST owners. Pat can be reached at: PJR @pmmic.com

UST Facility Inspections

What's Working, What's Not Working, What We Need to Do

Since 2001, we have been conducting annual loss-control inspections at our insured facilities. We use professional, independent compliance inspectors to perform the inspections. The inspectors do not own or operate the facility, they do not perform repair or maintenance services, nor do they sell equipment or other services. The inspector's only motivation is to inspect the facility and report accurately. These detailed, visual inspections have proven to be an excellent loss-control mechanism, capable of identifying leaks, compromised overfill equipment, compromised containment sumps, and other operational concerns. Our inspection results, combined with release data, help us improve our underwriting requirements, improve our operator training programs, and reduce the number and severity of releases from our insured facilities.

Inspections Versus Releases

For one population of tanks, we compared the results of annual loss-control inspections over a 10-year period with the release data from that population of tank systems. The following is a summary of key findings from this study group of more than 1,500 facilities.

Population demographics

- In 2017, the average tank age was 24 years old. More than 40% of these tanks were installed prior to 1990.
- 69% of the facilities rely on automatic tank gauging (ATG) as their primary leak-detection method.
- 21% of the facilities utilize secondary containment with interstitial monitoring (SCIM) as their leak-detection method.
- 76% of the tank compartments rely on automatic shutoff valves for overfill prevention.
- The facilities averaged four dispensers per facility.

The most recent certified compliance inspector facility inspection results

- 1.5% have overfill issues, down from a high of 8% in 2007:
  - 1 % were confirmed damaged or inoperable.
  - 0.5% required confirmation of operability.
  - 66% have liquid or debris in spill containment. This has ranged from 55% to 69% in the past 10 years.
- 6% require repair or replacement of at least one spill containment. This has ranged from 3% to 7% in the past 10 years.
- 45% have liquid or debris in piping sumps or UDC.
- 29% had active leaks in 2017. This ranged from 24% to 33% of facilities each year with an average of 29%:
  - 93% of leaks occurred at the dispenser.
  - 64% of the leaks were contained.
  - 36% of the leaks were uncon–tained.

Note: For comparison purposes, California recently released data from inspections conducted in 2017. The greatest number of violations were (1) failure to properly maintain secondary containment and (2) not meeting requirements relating to spill buckets. *(California Underground Storage Tank (UST) Leak Prevention. January – December 2017 Annual Report.)*

Release data since 2010

- Dispensers accounted for 46% of releases.
- Piping accounted for 18% of releases.
- 56% of piping releases were discovered via a leak detection method.
- Tanks accounted for less than 4% of releases.
- Overfills accounted for less than 3% of releases.
- 50% of overfills were related to transporter fault or intentionally disabled overfill devices.

Release discovery method

- Leak detection and inventory control identified 10% of releases.
- Inspections identified 12% of releases.
- 48% of releases were discovered at closure or during other intrusive testing.
- Previously unreported releases were discovered in 38% of tank closures.
- 2% of releases were discovered at system closure or by site assessments were related to overfills.

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■ The Risk Factor *from page 15*

- Nearly 30% of releases were not attributable to any one source because contamination was wide-spread, many times near the surface, and not concentrated in the vicinity of the tanks, piping, or dispensers.

Our Inspection and Release Data Support the Following Conclusions:

- **Spill prevention.** "30 day" walkthrough inspections of spill basins required by the new federal regulations are supported by the existence of liquid or debris in spill basins at between 55% and 69% of sites every year over a 10-year period.
- **Dispensers.** As the most significant source of leaks and releases over our 10-year study period, annual visual inspections of dispensers and UDC by a trained professional is supported. Dispensers and UDC should also be included in the 30-day walkthrough inspections. Inspections should look for leaks and the presence of liquids.
- **Overfill equipment.** Annual visual inspections of overfill equipment by trained professionals helped reduce overfill equipment deficiencies from 8% of facilities to less than 2% of facilities in the past 10 years. With only 3% of releases related to overfills, additional efforts focused on overfill equipment will produce limited improvements. Releases associated with intentional disabling of overfill devices will not be addressed by removing overfill devices to confirm proper operation. Annual visual inspections have addressed overfill issues.
- **Unknown source releases.** Our inspections and loss data indicate that surface spills may be a significant source of releases. A possible cause may be improper on-site disposal of liquids from containment sumps (see spill prevention conclusion above).
- **Inspector qualifications.** We have evaluated inspections conducted by UST facility employees (Class B and Class C operators), installation and service company employees (installers), and independent compliance inspectors. Independent compliance inspectors provided the most consistent and reliable results. Some monthly inspections by facility employees are successful at identifying system leaks and liquid or debris in sumps. Annual inspections should be conducted by trained (licensed where applicable), independent compliance inspectors. Monthly inspections should be conducted by persons with at least Class B operator qualifications. Class C operators may not have adequate knowledge or training to conduct monthly inspections.
- **Liquid Disposal.** Class B Operators should be trained on the proper handling and disposal of sump liquids.

In Summary

Tanks are no longer a primary source of releases. Piping and dispensers continue to be significant sources of releases. Frequent compliance inspections identify leaks and greatly reduce the severity of releases.

In the next issue of *LUSTLine* we will present our findings related to leak detection, containment sumps, and compatibility issues. ■

■ Tanknically Speaking *from page 14*

lower-priority alarms by computer algorithms? Besides increasing the likelihood that true releases could be responded to sooner, the data might show UST owners where to get the most return on their maintenance and repair investments, so that components that produced frequent service requests could be identified and corrected sooner rather than later.

If You Don't Have a Dream, How You Gonna Have a Dream Come True?

I know of at least one third-party ATG monitoring firm that is embarking on this quest to bring USTs into the world of big data.[2] It seems a dream now that such analysis could be routinely applied to the humble and hidden tank world. But I can remember a time when wooden gauge sticks represented the pinnacle of UST fuel measurement technology and automated fuel dispatching and automated fuel inventory were but pipedreams as well. Who knows what the future holds? In today's world, big data may pose a threat to our privacy, but in the technical world, big data also might make it possible to know with some assurance exactly what all those ATG alarms are telling us without having to lift a cover. ■

2. In the interests of full disclosure, I have been retained by this firm to help them understand UST systems.

California and Montana Release Reports

The California Underground Storage Tank Leak Prevention: January – December 2017 Annual Report indicated that 48% of releases were at least partially caused by tanks (combining old with new—based on when leaks were discovered), 29% were from unknown sources, and 19% were at least partially caused by dispensers. 86% of the releases were discovered as a result of tank system closure or a site assessment and 90% of the reported releases were old releases that were discovered in 2017. The report can be found here: *https://www.waterboards.ca.gov/ust/adm_notices/jan_dec2017_fnl_cal_ust_annual_rpt.pdf*

The Montana Department of Environmental Quality (MDEQ) released its 2017 Tank Autopsy Report. The state reported 43 confirmed petroleum releases in 2017, the highest total in 10 years. Nearly 75 percent of the new releases involved gasoline or diesel, with the remainder attributed to heating oil, waste oil, hydraulic fluid and jet fuel. Only one release was the result of corrosion of underground tank components. More common were dispenser and hanging hardware failures, including nozzles not shutting off or hose fittings becoming detached. ■

Field Notes

from Rick Long, Executive Vice President, Petroleum Equipment Institute (PEI)

Is a Wave of UST Replacements Coming?

Unanswered Questions about Tank Warranties and Useful Life

When the U.S. Environmental Protection Agency (USEPA) promulgated the 1988 federal underground storage tank (UST) rules, it set important new standards for the construction of the nation's tanks.

Under 40 CFR 280, new gas stations were allowed to install only UL-approved fiberglass, corrosion-protected steel, or composite tanks. The rule also established a ten-year phase-in period during which existing facilities had to upgrade, replace, or permanently close any USTs that did not meet the new standards.

The results were dramatic. At the time of the 1988 rule, USEPA estimated that more than two million USTs were in place at 700,000 facilities across the country, with roughly 75 percent of those tanks made of unprotected steel. By late 1999, the regulated UST population was down to 750,000 tanks at 300,000 sites. In March of this year, USEPA estimated approximately 550,000 USTs in use at 200,000 sites.

But even as noncompliant tanks were being permanently closed or replaced during the phase-in period, new tanks—often larger, compartmented ones—began to take their place. From 1988 to 1998, hundreds of thousands of fiberglass and cathodically protected steel tanks were installed throughout the nation.

Now, a new reality is coming into play. Because steel and fiberglass tanks typically carry a 30-year warranty, we are entering a 10-year period (2018 to 2028), in which those tanks will reach the end of their warranty period.

That raises a lot of questions for tank owners and operators. Here are the top four.

1. What does my warranty do and what does it mean?

Steel and fiberglass tank warranties work in essentially the same way. For a valid warranty claim, the tank must have been used to store only the substances for which it was designed and listed. The tank also must have been properly installed and maintained. Assuming those qualifying conditions are met, the warranty covers failures as a result of:

- External corrosion
- Internal corrosion
- Structural failure.

The warranty is limited to the cost of a new tank or repair of the old tank. It does not extend to costs the owner will incur to remove the failed tank, install a new one, or mitigate the environmental impact caused by the release.

Why are tank warranties set at 30 years? That's a good question with no particularly good answer. The 30-year warranty is essentially a marketing tool that lets fiberglass and steel tank manufacturers assure buyers that their tanks will last a long time. Tank manufacturers have never claimed to have any data, tests, or studies showing that tanks are likely to fail at 30 years. To the contrary, both fiberglass and cathodically protected steel tanks often have a much longer useful life.

A recent Arizona Department of Environmental Quality (ADEQ) study of 79 school-owned UST systems averaging 28 years of age fails to show that 30 years is an especially critical year in a tank's life. The study gave 73 percent of the tanks a "B" grade, signifying a tank with no loss of structural integrity and less than 5 percent of its surface showing signs of aging. Included within the B group were a 45-year-old steel tank and a 35-year-old fiberglass tank.

The 27 percent of the tanks graded as a "C" showed degradation (heavy flaking, blistering, corrosion, deformation, minor cracks) on up to 50 percent of the tank surfaces and possible structural issues. Certainly a cause of concern—but there is no indication in the data that tank age alone was to blame. The "C students" are more likely to be old, single-walled tanks, and no Arizona regulations require the removal of such tanks.

2. What do the states say about out-of-warranty tanks?

So far, not much. Only two states—Maine and Connecticut—require that tanks reaching a certain age must be removed from service.

Maine mandates removal of USTs at the end of their warranty period. Connecticut requires removal at the end of a tank's useful life, which the state defines as 40 years after the date of installation. Until 2016, Connecticut considered 30 years to be the end of a tank's useful life. There are no ifs, ands, or buts in these two states. Once a tank hits the relevant date, it has to be permanently closed or removed. However, so far, Maine and Connecticut are outliers. No other state has yet followed their lead.

3. Will I still be able to get insurance for an out-of-warranty tank?

Under 40 CFR 280, tank owners and operators must demonstrate that if a release occurs, they have the financial resources to clean up the site, correct any resulting environmental damage, and compensate third parties for their losses.

Private insurance and state funds are the two most common ways to meet the financial

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responsibility obligations. USEPA's most recent count shows that 36 states have financial assistance funds for tank owners and operators, and 16 companies offer private insurance to tank owners and operators.

How are these insurance carriers responding to the growing number of out-of-warranty USTs? Anecdotal reports suggest three basic approaches:

- Declining to cover out-of-warranty tank systems
- Continuing coverage but at much higher (and sometimes prohibitive) premium rates
- Conducting an inspection of the tank to determine whether coverage will be continued and, if so, at what price.

4. "Is there any chance tank manufacturers will begin offering extended warranties on older tanks?"

The answer to this one is almost certainly "no." We've asked them.

Although manufacturers are generally confident their tanks will outlast the warranty, they don't want to incur the costs associated with inspecting older tanks or the risks that an extended warranty would bring.

Two Modest Suggestions

As the out-of-warranty tank population grows over the next 10 years, owners, operators, insurance carriers, and state regulators will face complicated decisions on how best to deal with these tanks. Two steps at the state level could bring some clarity to the picture.

States should stand their ground.

Although Maine and Connecticut have made a choice to base tank closure and replacement requirements on the age of the tank, the other 48 states (and U.S. territories) would be well advised not to follow their lead.

Warranties for all sorts of consumer and business products have little relation to the item's useful life. A well-maintained lawnmower with a one-year warranty might run smoothly for 10 years or more. A new automobile warranted for 60,000 miles still may be going strong at 200,000 miles. Business and personal computers also regularly outlast their warranties.

In the same way, the useful life of a properly maintained UST may extend well beyond its warranty period. Rather than basing closure and replacement requirements on an arbitrary number, states should use inspections and other scientific criteria to manage the tanks under their jurisdiction.

States should compile, coordinate, and aggregate their data.

At present, the best available data on the nation's aging tank population can be found in an October 2015 study by the Association of State and Territorial Solid Waste Management Officials (ASTSWMO).

The study, "An Analysis of UST System Infrastructure in Select States," was intended to answer four questions:

- Is the nation's UST infrastructure getting older?
- If so, to what extent does this affect the risk of insurers and state tank funds?
- Are states collecting data in a way that will inform risk management decisions in the future?
- How do a state's policies impact owners' and operators' decisions on upgrading, replacing or closing their USTs?

Unfortunately, a surprisingly small number of states reported that they consistently, accurately, and comprehensively update their UST data. A few states, according to ASTSWMO, appeared to have no organized method at all for updating their records.

In the end, only eight states—Arizona, Colorado, Georgia, Minnesota, Missouri, Utah, Vermont, and Washington—submitted relatively complete data on the USTs under their jurisdiction. Such a sample is neither large enough nor diverse enough to be of much help in increasing our understanding of the nation's UST population or answering the questions posed by the ASTSWMO study.

But even if more states had participated, the 2015 ASTSWMO study was too premature to be of much value. Only 21 percent of the tanks in the eight participating states were 30 years or older—which, given the date of the study, means they were installed in 1985 or earlier, well before the wave of tank installations related to the 1988 federal UST rule.

The industry would be well served if the states could somehow come together to compile, coordinate, aggregate, and publish comparable data on the age, type, and history of their USTs—particularly those installed from 1988 to 1998. How many out-of-warranty tanks are still in the ground? How many already have encountered problems? Is there an increase in removals after the tanks go out of warranty? What is the real correlation between a tank's age and its useful life? Has the entrance of new fuels since 1988—including various ethanol, diesel, and biodiesel blends—had any impact on useful life?

Such data would help owners, operators, insurers, and regulators better evaluate the risks of aging tanks and make good decisions on how long to keep those tanks in service.

Putting these suggestions—particularly the second one—into practice won't be easy. But the benefits to the industry would be worth it. ■

Breaking Ground for EV Charging at Old Gas Stations

by Dan French

Posted by: Captain Planet July 30, 2018

The age of the electric vehicle (EV) is standing up and myriad models of electric cars, big rigs, flying taxis, and drones are coming to market. This future fleet of EVs just over the horizon presents an opportunity for recharging the redevelopment potential of old fueling stations today.

Electric vehicle (EV) battery technology is breaking out. Prices keep dropping and performance keeps improving. Multiple companies are building lithium batteries big enough for industrial purposes and powerful enough to pull "big rig" trucks—both realities coming to market that seemed like far off dreams just a decade ago. The implication for smaller-scaled vehicles is profound as scores of EVs are on the market or in development. Today's lithium-ion batteries offer longer range and higher performance at prices lower than ever before…and there will be no going back. Bottom line: We're going to need more charging stations. A lot more, and old weed-ridden gas stations may well help fill that bill.

As the number of EVs in use grows, the number of charging stations must also grow–just as in the great internal combustion engine buildout a century ago.

The industry is racing to ramp up the infrastructure needed to network communities across North America's existing roads, highways and interstates. EV charging stations and single-serving charging outlets are popping up across the landscape, often in the same convenient parking lots and intersections drivers frequent already.

The EV industry hopes to soon support its consumers with the same omnipresence of conveniently placed, easy-access charging stations that gas-powered automobile drivers currently enjoy. Eventually the continental EV charging network of stations in North America may grow larger than that of petroleum s.

Charge times are also shrinking. Numerous efforts are underway to substantially reduce lithium-ion charging times by automakers, energy firms, and technology startups.

Locating Next-Generation Fuel Stations

So far, much of this EV buildout has focused on charging infrastructure for heavy-duty equipment like trucks and buses, as well as locating charging stations in disadvantaged, low-income communities. Michigan's largest utility, DTE Electric Co. with 2.2 million electricity customers, recently proposed a three-year, $13 million EV infrastruture program, dubbed Charging Forward, that would provide rebates for residential, commercial and fleet EV charging infrastructure as well as consumer education programs.

Developing EV infrastructure and other clean technologies in disadvantaged communities, which are often polluted or near pollution, can be an important first step in turning them around. Clean-tech-on-brownfield development is catching on as a Healthfield strategy to convert dirty sites to clean, productive uses and capture the sustainability gains of such a flip, but also because these old brownfield sites work well as EV stations.

In 2011, the Department of Energy's National Renewable Energy Laboratory (NREL) produced a useful guide for reusing brownfield sites for EV charging stations. *The Guide for Identifying and Converting High-Potential Petroleum Brownfield Sites to Alternative Fuel Stations* was a groundbreaking study prepared in partnership with USEPA's RE-Powering America's Land Initiative led by Caley Johnson, Dylan Hettinger, and Gail Mosey.

The NREL guide explains how some brownfields, such as former gasoline stations, make ideal sites to sell alternative fuels and offer charging connections because they are typically in locations convenient to

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■ EV Charging Stations
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vehicles. The built infrastructure of these sites often makes former gas stations conducive to redevelopment as EV stations because they already have the electrical, water, and sewer connections required to operate.

The guide outlines several objective site selection criteria useful in surveying for potentially viable sites, how to prioritize them, and then applies that assessment framework to five of the most popular alternative fuels—electricity, natural gas, hydrogen, ethanol, and biodiesel. Corridors between San Francisco and Los Angeles, California; Seattle, Washington, and Eugene, Oregon; and the Chicago-Milwaukee area are examined as opportunities for alt-fuel station development.

The second part of NREL's guide delves into these site selection criteria and tools used in detail to demonstrate how anyone might repeat the process to assess an alternative fuel site's suitability at the local level. Two case studies featuring the conversion of two former gas stations in the Seattle-Eugene area into EV charging stations are examined and assessment criteria applied. The guide's four tools for gas-to-EV assessment are:

- An NREL map of existing infrastructure, hybrid electric vehicles (HEVs), and LUST sites
- State databases of LUSTs and their attributes
- An alternative fuel station locator at the DOE's Alternative Fuel and Advanced Vehicles Data Center
- Google Maps "search nearby" function to find nearby sites that can keep people occupied while they wait for their vehicle to recharge.

Togther, the four tools enable a basic examination of any site based on 12 criteria. And the third part of NREL's useful guide explores steps to be taken after a specific site has been selected for development such as choosing and installing the recharging equipment, which includes steps to take in the permitting process and key stakeholder involvement.

Clean Energy Corridors and Cleanups

Even before NREL's 2011 guide, visionary EV champions were working in numerous ways to lay the foundation for the boom to come. The Alternative Fuels Corridor Pilot Project began redevelopment of the Interstate 5 (I-5) corridor that runs 1,350 miles from the northern U.S. border with Canada, through Washington, Oregon, and California, to the southern U.S. border with Mexico along the West Coast Green Highway.

Washington and British Columbia signed a memorandum in June, 2008. Designated a "Corridor of the Future" by the U.S. Department of Transportation, Washington, Oregon and California then signed a tristate Memorandum of Understanding agreeing to work together to develop throughout the I-5 Corridor. The memorandum laid out common goals, a work plan, and activities to construct infrastructure along this new fuels corridor.

> ***Next generation EV stations are close to being "plug and play" developments at many current and former gas stations because they have electrical hookups and superior ingress/egress to existing roadways.***

In 2009, an Alternative Fuels Corridor Economic Feasibility Study was prepared for the Washington State Department of Transportation. In 2011, the first phase of development installed charging stations along I-5 and U.S. 2 in Washington every 40 to 60 miles.

For years, gas station redevelopment advocates have touted the potential of closer cross-program coordination between the various LUST programs and voluntary cleanup programs to better position unused sites languishing in limbo and LUST corrective action into EV stations. Overall, the U.S. LUST cleanup backlog stands at 68,295 releases in USEPA's last national summary report, so there are plenty of opportunities to pair cleanup on legacy gas station sites with new, clean productive use EV stations.

There are specific programs targeted at abandoned gas stations, such as Ohio's Abandoned Gas Station Cleanup Grant Program, in addition to the many other federal, state, and local resources able to be leveraged in a brownfield redevelopment.

In December 2010, USEPA Region 9 and the California Environmental Protection Agency's State Water Resources Control Board (SWRCB) launched the UST Cleanup Partnership in the Interstate 710 (I-710) Corridor as a focal point of California's Accelerated Cleanup Project. Its purpose is to:

- Accelerate the cleanup of abandoned gas station sites
- Better prevent contamination at active gas station facilities
- Remove barriers to neighborhood revitalization efforts.

As market conditions ripen and the private sector begins a new phase of substantial EV investment, many of these programs and similar projects will dovetail into powerful partnerships and repurpose hundreds of thousands of once and future fuel stations.

Rebuilding the Future on the Bones of Past Success

Tens of thousands of gas stations have closed in recent decades. Yet, there is no accurate count of the actual number of closed stations. USEPA estimates that as many as half of all brownfields have petroleum concerns because they were used as distribution points. And there could be anywhere between half a million and a million brownfields in the U.S.

Many can be useful again as distribution points for new forms of energy. A gas station in Long Island City, for example, sat vacant for years with subsurface petroleum contamination leaching through soil and into well water. In 2012, a $1 million renovation converted the vacant gas station into a yoga studio, wellness center, and EV charging station.

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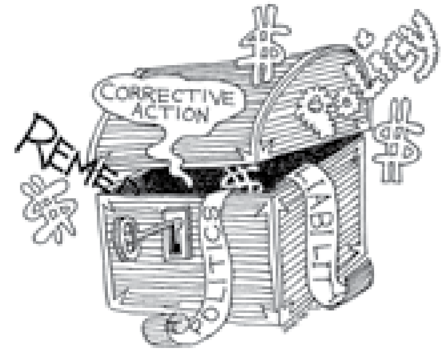
Unlocking the Mystery of FR

A straight-talking column by Jill Williams-Hall, a Sr. Planner with the Delaware DNREC, on assignment to USEPA's Office of Underground Storage Tanks, Washington, DC. Jill can currently be reached at: williams-hall.jill@epa.gov.



Self-Insured Retentions

When Is a Self-Insured Retention Acceptable?

In the December 2017 issue of *LUSTLine* I explained what a self-insured retention (SIR) is and how it differs from a deductible in an insurance policy. To review: a SIR is the dollar amount that must be paid by the insured before the insurance policy starts paying. This is different from a deductible, where the deductible is actually part of the policy coverage limit. USEPA's regulations require insurance companies to provide first-dollar coverage for deductibles.

First-dollar coverage requires the insurance company to pay the claim without waiting for the insured to pay the amount of the deductible before the insurance company steps in. The reason for this is so that corrective action is not delayed. The policyholder is still responsible for reimbursing the insurance company for the deductible amount. However, because SIRs are not part of the policy coverage limits, they are not covered by the first-dollar coverage provision. Corrective action could be seriously delayed if the policyholder does not have the funding to cover the costs to begin remediation activities.

So when is a SIR acceptable, and when is it not—considering a particular policy is utilized to comply with 40 CFR 280, Subpart H?

40 CFR 280, Subpart H, requires that insurance is available to cover the cost of corrective action and third-party damages for bodily injury and property damage during the term of the policy—from the inception date of the policy forward. However, an insurance policy may be written to cover claims for releases prior to the date the policy became effective, known as a retroactive date. Retroactive dates are not required by USEPA regulations but they provide more financial coverage to the policyholder and are strongly encouraged.

If the SIR is applied to a claim made after the inception date of the policy, it does not fulfill the financial responsibility requirements of 40

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ASTSWMO—The UST/LUST Connection

The Association of State and Territorial Solid Waste Management Officials (ASTSWMO)'s Tanks Subcommittee includes four Task Forces that serve as liaisons between state UST programs and the USEPA, and provides a forum for sharing information and ideas among state regulatory officials. The mission of the Emerging Fuels Task Force is to assist the state and territory UST programs by providing resources and information related to managing the storage and releases of new fuels in use or in development.

This article was contributed by Lon Revall, Program Manager for Georgia DNR's UST Management Program, on behalf of the ASTSWMO Emerging Fuels Task Force.

Our New Corrosion Observations Tool

ASTSWMO's Emerging Fuels Task Force created the Corrosion Observation Tool for the purpose of submitting information on UST system corrosion observed during inspections and removals in the field. The tool was designed to be used by UST regulators, inspectors, contractors, and owners to report incidences of corrosion. The goal of the tool is to assemble essential data that will help identify trends, and, hopefully, identify potential problems before they become widespread. The tool is can be found at: *http://astswmo.org/astswmo-corrosion-observations-tool/*

The tool has been designed to be intuitive and gathers information such as estimated age of the component, the type of fuel being stored, how the corrosion was discovered, and whether there was a release associated with the corrosion. The tool then asks the user what equipment was corroded and provides examples of corrosion photos to help the user rank the severity of the corrosion observed: 1) Low to Moderate; 2) Significant; and 3) Severe. UST components addressed in the tool include:

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FAQs from the NWGLDE

...All you ever wanted to know about leak detection, but were afraid to ask.

Release Detection Methods: CITLD vs SIR

Q. The 40 CFR Part 280 2015 revised federal UST rule added continuous in-tank leak detection (CITLD) as a release detection method. This category includes both continuous statistical release detection, also referred to as continuous automatic tank gauging (ATG) methods, and continual reconciliation. The revised rule also added Statistical Inventory Control (SIR) as a release detection method. How do these three release detection methods compare and what should be considered when deciding which method to use for monitoring your UST systems?

A. Table 1 compares the characteristics of all three release-detection methods in question. All of these characteristics should be taken into account when selecting the method best suited for individual UST system operations. This is a general outline. Check with the state or tribal UST implementing agency where your UST system is located to determine what is or is not allowed and if additional requirements apply. For information about these methods, including a detailed description and the federal regulatory requirements, you can access the "Internal Methods" tab on the following USEPA webpage: *https://www.epa.gov/ust/release-detection-underground-storage-tanks-usts*.

Table 1. A Comparison of CITLD vs SIR Release-Detection Methods.

CITLD		
ATG Continuous	**Continual Reconciliation**	**SIR**
Covers tanks but not lines. Does not monitor for theft or delivery volume. Does not account for dispensing during delivery. Requires down time to look for releases.	Covers tanks and lines. Does not monitor piping to satellite dispensers unless satellite dispenser has a separate totalizer. Monitors for theft and delivery volume. Does account for dispensing during delivery. Does not require down time to look for releases.	Covers tanks and lines. Does not monitor piping to satellite dispensers unless satellite dispenser has a separate totalizer. Monitors for theft and delivery volume. Does account for dispensing during delivery. Does not require down time to look for releases.
Measurements taken on an ongoing basis, except for dispensing and delivery interruptions.	Measurements taken once per minute or more (depending on fuel level).	Measurements taken once a day by ATG or by manually sticking the tanks.
Results reviewed by owner.	Results reviewed by third party.	Results reviewed by third party or by owner with appropriate software.
Can complete a valid test as long as throughput limitations are met.	Can complete a valid test as long as throughput limitations are met.	May or may not meet 30-day requirements, depending on vendor requirements for data collection and data analysis
Can be affected by: temperature, dispenser meter calibration, and stability of liquid level.	Can be affected by: temperature, dispenser meter calibration, stability of liquid level.	Can be affected by: person sticking the tank, poor record keeping, and meter calibration.
Data automatically collected.	Data automatically collected.	Data manually collected.
Can test manifolded tanks.	Can test manifolded tanks.	Can test manifolded tanks.
High-throughput facilities may not have enough "downtime" for valid testing.	May detect leaks even in higher throughput systems by analyzing more data at any given time.	May miss increasingly larger leaks in higher throughput systems.

About the NWGLDE

The NWGLDE is an independent work group comprising 11 members, including 10 state and 1 USEPA member. This column provides answers to frequently asked questions (FAQs) the NWGLDE receives from regulators and people in the industry on leak detection. If you have questions for the group, please contact them at questions@nwglde.org. ■

■ EV Charging Stations

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Charging stalls were installed where the gas pumps had been. Affixed to a 30-foot ledge behind the station, a wind turbine and solar panels are generating electricity that is offered to the public free of charge.

As focal points of community revitalization on Main St. or traffic along major transportation routes, former gas stations can present outsized opportunities for EV station redevelopment. While typically located on small parcels potentially unsuitable for larger commercial uses (e.g., mixed use), next generation EV stations are close to being "plug and play" developments at many current and former gas stations because they have electrical hookups and superior ingress/egress to existing roadways.

As recharging times continue to decrease, we can expect market forces to continue to manifest new opportunities for gas station redevelopment. The usual hurdles to real estate reuse exist (e.g., environmental assessment requirements, potential remediation or liability exposure, but the EV market growth will likely subsume these concerns just as in other redevelopment segments wherever demand catches up to land supply.

As with other types of brownfield sites, petroleum brownfields are increasingly in demand. Notwithstanding their issues, these properties are highly attractive to EV station developers, especially those in key locations and well-trafficked intersections. Convenience is king again. And convenience is a characteristic many of these old sites can offer. ■

Dan French is CEO of Brownfields Listings, LLC. He can be reached at dan@brownfieldlistings.com. For a more in-depth version of this article visit Dan's blog at https://brownfieldlistings.com/blog/post/battery-breakthroughs-are-breaking-ground-for-ev-charging-at-old-gas-stations

■ Self-Insured Retentions

from page 21

CFR because the SIR is not covered by the first-dollar coverage provision. A combination of mechanisms would have to be utilized to comply with the financial responsibility requirements. An owner or operator would have to show proof of financial responsibility for the amount of the self-insured retention.

However, if the SIR is applied only to claims during the period prior to the inception date (e.g., back to the retroactive date), the policy does fulfill the financial responsibility requirements of 40 CFR 280, Subpart H. Tank owners or operators should carefully review the language for any SIR attached to a policy to ensure it is only for claims made prior to the inception date of the policy and to make certain they fully understand the policy will not cover claims until the amount of the SIR has been expended by the policy holder. ■

■ Corrosion Observations Tool

from page 21

- Tank or Lining
- Submersible Turbine Pump Area
- Drop Tube or Overfill Prevention Device
- Automatic Tank Gauge Components
- Flexible Connectors
- Other Connection Points.

The tool provides comment boxes to allow the user to provide additional pertinent information and allows the user to upload photos (we highly encourage all users to submit photos).

The Emerging Fuels Task Force will continue to refine this tool so that it is as useful and user-friendly as possible. If you find a question to be unclear, confusing, or if you have suggestions on how to improve the tool, please submit and address your comments to Charles Reyes at *www.astswmo.org*. ■

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Tank News From NEIWPCC........

The 26th National Tanks Conference & Exposition (NTC) is scheduled for September 11-13, 2018, at the Galt House Hotel in Louisville, Kentucky. Pre-conference workshops will be held on Monday, September 10. The NTC will bring together hundreds of professionals from the tanks field, including state, tribal, and territorial employees, federal regulators, and industry representatives. Attendees will have the opportunity to network and learn about emerging issues, policy, equipment, and more. Please visit the official conference website to register or access additional information: *http://www.neiwpcc.org/ntc2018*. Online registration will remain open through August 16.

Following the NTC, NEIWPCC looks forward to working with our partners to provide a number of training opportunities for state, tribal, and territorial employees. We will be offering online training for two key audiences:

- Our UST Inspector Training Webinar Series is aimed mainly at UST inspectors and release-prevention professionals. Archived webinars from the series can be found at: *http://www.neiwpcc.org/inspectortrainingwebinararchive.asp*.
- For those interested in LUST issues, we will continue to offer training through our LUST Corrective Action Webinar Series. Please visit our archive to view previous webinars from this training series: *http://www.neiwpcc.org/lust-cawebinararchive.asp*.

If you are interested in attending our live webinars in the future, stay tuned for announcements related to upcoming training offerings in both webinar series.

If you have any questions about NEIWPCC's UST/LUST program, please contact Drew Youngs. We hope to see you at the 26th NTC in September! ■

L.U.S.T.Line Index

August 1985/ Bulletin #1 – December 2017/ Bulletin #83

To download the index, go to

www.neiwpcc.org/lustine/

then click on *LUSTLine* Index.