Taylor&Mulder

Property and Casualty Consulting Actuaries

Arizona Department of Environmental Quality
Analysis of Proposed New
Underground Storage Tank Program
As of June 30, 2014

October 2014
Revised November 17, 2014

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November 17, 2014

Ms. Tara Rosie, Manager
UST Corrective Action Section, Waste Programs Division
Arizona Department of Environmental Quality
1110 West Washington St.
Phoenix, AZ 85007

RE: Arizona Department of Environmental Quality; Analysis of Proposed New Underground Storage Tank Program

Dear Ms. Rosie:

Enclosed is the actuarial review of the proposed new underground storage tank program of the Arizona Department of Environmental Quality Underground Storage Tank Program and the UST Assurance Fund as of June 30, 2014.

The first section in the text of our report is the Executive Summary section. This section presents our conclusions and recommendations. It also describes the purpose and scope of our report, explains the distribution and use of our report, and provides the conditions and limitations underlying our work. This section of our report includes the Background section which provides information about the ADEQ Underground Storage Tank Program history.

The next section of the text of our report is the Actuarial Analysis section that describes the sources of data, our overall methodology, the selection of factors and specific methodologies and considerations by line of business. It also describes the selection of ultimate losses, and loss reserve discounting. The Exhibits section of our report follows the text of the report and includes all of our analyses.

Please feel free to call if you have any questions regarding any aspect of our report.

Sincerely,

Jane C. Taylor

Jane C. Taylor, FCAS, MAAA, JD

Evelyn Toni Mulder

E. Toni Mulder, FCAS, MAAA, FCA

Daniel W. Lupton

Daniel W. Lupton, FCAS, MAAA, MBA
Enclosures
Revised November 17, 2014

Arizona Department of Environmental Quality
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Underground Storage Tank Program
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Contents

Executive Summary

Purpose and Scope

Taylor & Mulder, Incorporated ("T&M") was requested by the Arizona Department of Environmental Quality (the "ADEQ") to conduct an actuarial review of the proposed new underground storage tank ("UST") corrective action program including loss and loss adjustment expense reserves associated with liabilities arising from the operation of the underground storage tank program as of June 30, 2014. This report contains our summary, conclusions and recommendations along with a description of the analysis underlying our conclusions.

Specifically, T&M was asked by the ADEQ to conduct an actuarial analysis to include within its scope a financial analysis of the proposed new underground storage tank corrective action program and implementation of both the new corrective action program and the existing underground storage tank leak prevention program. Details are included for using the State Assurance Account, and specifically the State Assurance Fund ("SAF") monies to:

1) Estimate amounts required to fund ADEQ management and operation of the proposed new corrective action program and the leak prevention program;
2) Determine amount required to fund the corrective action program costs for releases open as of May 1, 2014 that include amounts:
    a) For releases reported by June 30, 2006
        i) Cleanup to Tier 1 cleanup standards
        ii) Cleanup to alternative closure standards (Tier 2 and Tier 3) and
    b) For releases reported subsequent to June 30, 2006

i) Cleanup to Tier 1 cleanup standards

ii) Cleanup to alternative closure standards (Tier 2 and Tier 3).

3) Determine amount required to fund Baseline Assessments of all UST sites with tanks that have not been permanently closed to determine whether the installed USTs are leaking and to:

   a) Estimate costs based on an average of ten vertical borings per site

   b) Estimate costs based on an average of two angle borings and four vertical borings per site

   c) Estimate costs based on an average of four angle borings per site.

4) Determine amount required to fund corrective action costs as necessary for releases identified from Baseline Assessments by estimating the percentage of releases that have impacted groundwater and those that have soil-only impacts and apply percentage to evaluate funding under the following options:

   a) Option #1: Cleanup required to Tier 1 Cleanup Standards

   b) Option #2: Cleanup to alternative closure standards (Tier 2 and Tier 3).

5) Determine amount required to fund costs for removal of underground storage tanks at the request of owner or operator.

6) Determine amount required to fund corrective action costs as necessary for releases identified during removal of underground storage tanks by estimating percentage of releases that have impacted groundwater and those that have soil-only impacts and apply percentage to evaluate funding under the following options:

   a) Option #1: Cleanup required to Tier 1 Cleanup Standards

   b) Option #2: Cleanup to alternative closure standards (Tier 2 and Tier 3)

7) Estimate costs of all future liabilities, including corrective action expenses for unidentified releases not discovered through Baseline Assessments.

8) Determine required funding for reimbursable costs for SAF applications:

   a) For releases reported by June 30, 2006

      i) Releases currently open

      ii) Releases closed prior to May 1, 2014

   b) For releases reported after June 30, 2006.

9) Estimate the number of additional staff required to manage proposed new corrective action program and leak prevention program.

10) Evaluate projected annual revenue from the penny-per-gallon tax collected from January 1, 2015 for five, ten, fifteen, and twenty years.

11) Include an analysis of reasonable rates for deductibles to be paid by owners and operators to defray the costs for the Baseline Assessments, corrective actions and tank removals, the projected revenue from collection of those deductible amounts and the estimated reduction in revenue from deductibles based on the estimated financial need of UST owners and operators.

12) Analyze the solvency of the Assurance Account, evaluate revenue and expenditure stream, project costs that are eligible or will be eligible for payment from the account, and determine if projected revenues are sufficient to address current and future corrective action program needs.

13) Analyze the total aggregate liability which shall include current liabilities and an estimate of future liabilities. In doing so, the Contractor shall provide separate subtotal amounts for each of the program components identified in the detailed list above.

14) Estimate the amount of funding needed to fully fund the total liability that may arise.

15) Provide revenue and cash flow projections for the estimated life of the program.

16) Analyze potential costs for scenario in which Arizona sets up and operates as a mechanism fully meeting financial responsibility requirements (corrective action coverage plus third party claims). The analysis is anticipated to include:

    a) Review of expense including employing adequate staff to execute that strategy, the effect of government-led cleanup on potentially reducing cleanup costs, and the revenue associated with participation by tank owners;

    b) Comparison those items to the number of tanks and number of claims coming in;

    c) Consideration of the impact on Arizona's financial statements associated with such a change; and

    d) Estimation of tank-owner participation and potential costs including costs or changes in exposure associated with ensuring that tanks are up to code. There may also be changes if individuals chose not to participate because some will buy private insurance and some will self-insure.

Please note: This study was contracted at the end of Fiscal Year 2014, and the data sets used represent information available at that time, assuming implementation of proposed program components in Fiscal Year 2015. Delays in implementation may alter projections per fiscal year.

This report presents the results of those analyses. This report was prepared by:

Jane C. Taylor, FCAS, MAAA, JD Principal and Consulting Actuary;

Evelyn Toni Mulder, FCAS, MAAA, FCA, Principal and Consulting Actuary; and

Daniel W. Lupton, FCAS, MAAA, MBA, Vice President and Consulting Actuary.

In accordance with the requirements of the Actuarial Standards of Practice in making statements of actuarial opinion, I provide the following statement:

> *I, Jane C. Taylor, am Principal and Consulting Actuary in the firm of Taylor & Mulder, Inc. I am a Fellow of the Casualty Actuarial Society in good standing and qualified to issue a Statement of Actuarial Opinion. I am also a Member of the American Academy of Actuaries.*

Background

The Arizona Department of Environmental Quality Underground Storage Tank ("UST") program State Assurance Fund ("SAF") was established in 1990 to assist eligible owners and operators in meeting the costs of Leaking USTs ("LUST") investigation and remediation in cases where the owner or operators of the leaking USTs cannot be located or are otherwise incapable of performing remediation. The SAF also provided reimbursement to UST owners and operators for eligible cleanup costs and funded the ADEQ for the cost of administering cleanup requirements, the cost of administering the SAF, and for costs incurred by the ADEQ in performing cleanups. The SAF provided a basic limit of coverage of $500,000 per release; however, UST owners or operators could qualify for up to $1,000,000 of coverage under certain conditions.

In 2004, Senate Bill 1306 (46th Legislature; 2nd Regular Session, Chapter 273, 2004) was passed, terminating the SAF with LUSTs reported after June 30, 2006 ineligible for coverage through the fund. In addition, after June 30, 2010, applications made or expenses incurred for eligible LUSTs (those reported prior to June 30, 2006) would not be accepted. That is, payments on eligible LUSTs ceased on June 30, 2010.

The SAF was funded through a $0.01 per gallon excise tax on operation of regulated USTs. Revenue shortfalls affecting the SAF led to the ADEQ instituting a ranking program on March 31, 2010, whereby known releases of petroleum product are ranked in terms of financial need of the eligible party, the risk to human health and the environment posed by the release, and whether a delay in remediation would adversely affect the cleanup process in the future. Higher

ranked releases received at least partial reimbursement for remediation expenses first while reimbursements for lower ranked releases were delayed.

Conclusions

Corrective Action for Releases Open as of May 1, 2014

The following chart summarizes the reserves required for the cost of cleanup until final closure for releases that are open as of May 1, 2014:

Arizona Department of Environmental Quality
Reserves for Cleanup of Releases Open as of May 1, 2014

Report Date	Tier 1 Standard	Tier 2 Standard	Tier 3 Standard
By June 30, 2006	$45,831,846	$42,213,653	$41,740,450
After June 30, 2006	$8,636,395	$7,613,341	$7,074,543
Grand Total	**$54,468,241**	**$49,826,994**	**$48,814,993**

These are the expected amounts that will be required to be paid for the remaining costs of cleanup until closure for all claims that are open as of May 1, 2014. For instance, if all claims are cleaned to a Tier 1 standard of cleanup, the anticipated cost to close all claims currently open is $54,468,241. Of this amount, $45,831,846 will be required to clean up releases reported by June 30, 2006, with an additional $8,636,395 required to clean up releases reported after the sunset date of the fund but on or prior to May 1, 2014.

If all claims are cleaned to a Tier 3 standard of cleanup, the anticipated cost to close all claims currently open is $48,814,993.

A major source of airborne lead pollution prior to 1996 was gasoline containing tetraethyllead ("TEL") as an additive. TEL was used as an additive to gasoline to boost octane rating (a measure of combustibility of fuel relative to the combustion of 2,2,4-trimethylpentane, also known as iso-octane). Increased octane rating allowed for higher engine compression and thus higher fuel economy. In addition, higher octane rating prevented "knocking" caused by the early or late combustion of gasoline in an engine cylinder due to the combustibility of the fuel not being appropriate for the design of the engine. This incorrectly timed combustion creates high-frequency pressure waves (i.e., a sound wave that the human ear hears as a knocking sound) that can damage car engines.

Lead from TEL in gasoline becomes airborne as part of engine emissions, which made it hard to avoid exposure to the damaging properties of lead in gasoline. In addition, TEL was damaging to catalytic converters and spark plugs in vehicles. The federal government began to phase out the use of lead in gasoline in an effort to protect its citizens and the environment, with the final phase-out of lead in 1996.

When TEL was being phased out, gasoline producers needed something to replace it in fuel to keep fuel prices as low as possible and to help reduce harmful emissions. By 1979, producers had identified Methyl Tertiary Butyl Ether ("MTBE") as a potential replacement. MTBE is a volatile, flammable, relatively inexpensive, colorless liquid that blends easily with gasoline, and, as an oxygenating agent, increases octane rating, thus preventing knocking. Its reasonable cost, cleaner emissions, and blending characteristics eventually made it the choice additive of gasoline producers.

As is often the case, fixing one problem can create others. While emissions from MTBE-enhanced gasoline are better for the environment than lead in TEL, in a situation where a gasoline leaks from a storage tank, MTBE can create issues. Once an MTBE-enhanced fuel leaks from an underground tank, the properties of MTBE allow it migrate faster and farther than other gasoline components, making it more likely to reach groundwater and to contaminate wells. In addition, MTBE is highly soluble in water, meaning that if it reaches groundwater, it blends with water as quickly as it blends with gasoline. The resulting groundwater contamination can be smelled and tasted in the contaminated water. The Environmental Protection Agency ("EPA") states in one of its publications:

> *MTBE does not degrade (break down) easily and is difficult and costly to remove from groundwater…..*
>
> *MTBE is generally more resistant to natural biodegradation than other gasoline components. Some monitoring wells have shown little overall reduction in MTBE concentration over several years, which suggests that MTBE is relatively persistent in groundwater. In contrast, studies of surface water (lakes and reservoirs) have shown that MTBE volatilizes (evaporates) relatively quickly.*

In 2005, Congress passed the Energy Policy Act, which removed the oxygenate requirement for reformulated gasoline ("RFG") and mandated that increasing levels of biofuel (typically ethanol) must be mixed with gasoline sold in the United States in subsequent years. Therefore, MTBE was quickly replaced with ethanol in fuel. This is important for the ADEQ, as projections based on prior payments for clean-up almost certainly involve gasoline with MTBE as an additive. According to the EPA:

> *MTBE can complicate remedial activities because of its greater water solubility and resistance to natural biodegradation. Thus, the costs can be higher than those associated with the treatment/remediation (EPA 510-F-97-015, January 1998) for benzene or other gasoline components.*

Therefore, the projected costs of clean-up for leaks occurring after 2005 should realize a reduction in costs relative to leaks occurring in 2005 or prior. The impact of that reduction is unknown at this time.

While the removal of MTBE may reduce costs, there is potential for increased failure of tanks as a result of a recent switch to Ultra-Low Sulfur Diesel ("ULSD") and an upcoming switch to Ultra-Low Sulfur Gasoline ("ULSG"). These changes may impact both the frequency and severity of future claims.

It is unknown whether the combination of these effects will lead to an increase or decrease in frequency or severity of future claims. Projections in this report assume that the combined effects will offset one another, and future claim frequency and severity will reflect historical claim frequency and severity.

Baseline Assessments for UST Sites

The purpose of a Baseline Assessment at UST sites is to determine if prior unknown petroleum contamination has occurred at a given site. Current tank owners and operators with commercial insurance have at times been denied coverage under their commercial insurance in recent years. The reason for this has to do with the way that commercial insurance provides coverage.

Commercial insurance may be either "claims-made" or "occurrence" coverage. Under occurrence coverage, a loss-triggering incident that *occurs* during the coverage period is

covered *regardless of when that claim is reported*. Thus, for an occurrence policy effective from January 1, 2013 through December 31, 2013, if a petroleum release occurs on July 15, 2013, but is not reported to the insurer until April 30, 2014, the release is still covered by the 2013 occurrence policy.

The Environmental Protection Agency notes in its December 2011 study titled "EPA Study on the Effectiveness of UST Insurance As A Financial Responsibility (FR) Mechanism," page 5, footnote 7 that:

> *Most UST insurance policies today are claims-made insurance policies. Claims-made insurance policies provide coverage that depends on both the time of the occurrence and the date of filing or receipt of the claim. These policies often include a retroactive date that is the point in time when coverage first begins. The policy provides coverage for occurrences that happen after the retroactive date for which a claim is filed within the policy period and any extended reporting period.*

The retroactive date (often referenced as "Retro Date") is generally the date that a claims-made policy was first written or, if the insured has changed insurance carriers, the date the new carrier writes the first policy. The use of a Retro Date in a claims-made policy protects an insurer from assuming the risk that unknown releases may have occurred many years ago that remain undiscovered. Given that identifiable petroleum additives have changed over the years, insurers can deny coverage if it can be determined that the contamination occurred prior to the Retro Date by an analysis of the additives in the contaminated soil.

Both occurrence and claims-made coverages rely on the date of the loss-triggering event to determine coverage although each has its own rules. For occurrence coverage, the loss-triggering event must occur during the policy period while claims-made coverage requires

that the loss triggering event occurred after the Retro Date and that the event be reported during the policy period.

Claims-made coverage is often popular with insureds because the cost for the initial coverage years is lower. However, the cost of claims-made coverage increases each year until the premium for the coverage approaches that of an occurrence policy. The first year of a claims-made policy covers only claims that both occur and are reported in that first year. In the second year of a claims-made policy, the insurer covers releases that occurred in either the first *or* second year which are reported in the second year. As a result, the insurer's exposure and premium is higher with each successive year of a claims-made policy because the insurer covers claims with occurrence dates in all prior years for which coverage has been provided.

T&M has been informed that some insureds in Arizona have not maintained their Retro Dates, choosing instead to "reset" their coverage to reduce premiums. However, this "reset" reduces coverage. After resetting the policy, if an insured identifies a release, insurers may deny coverage on the basis that the loss-triggering event may have occurred prior to the (new) Retro Date of the policy.

Therefore, one of the components of the proposed new revised corrective action program involves performing Baseline Assessments at each site. In the event of a release identified in the future, the results of these Baseline Assessments would function as "proof" that the identified release occurred after the date of the Baseline Assessment, thus preventing insurers from denying coverage to insureds.

The following chart summarizes the anticipated cost of performing Baseline Assessments by type of boring at all sites for which there are underground storage tanks that have not been permanently closed.

Arizona Department of Environmental Quality Cost of Performing Baseline Assessments as of May 1, 2014	
Type of Borings	**Cost**
Total Cost for 10 Vertical Borings Per Site	$38,059,692
Total Cost for 2 Angle Borings and 4 Vertical Borings Per Site	$38,910,857
Total Cost for 4 Vertical Borings Per Site	$32,505,376

The cost estimates above include the cost of site preparation, including equipment mobilization costs, which may be substantial. Making only four vertical borings per site reduces the overall costs only slightly when compared to the cost of ten vertical borings. However, using only four borings may reduce the efficacy of the Baseline Assessment.

There are several potential drawbacks with performing Baseline Assessments at each site. First, Baseline Assessments are time consuming, and estimates by separate parties suggest that assessments at all sites would require four to five years to be completed. Second, if the ADEQ opts to provide a mandatory full financial responsibility ("FR") mechanism, Baseline Assessments may not provide information necessary for state fund coverage. Third, the ADEQ is currently exploring alternatives to traditional Baseline Assessments that might provide more accurate and faster identification of releases on an annual basis rather than as a one-time "snapshot" of soil conditions at each site. Fourth, there is the possibility that denials of coverage by commercial insurers may be improper denials, and it may be more appropriate to resolve a pattern of coverage disputes through dialog with the Arizona Insurance Department. Therefore, we recommend a thorough review of the appropriate

strategy for the ADEQ going forward before commencing with any plan to perform Baseline Assessments.

Corrective Action for Releases Identified through Baseline Assessments

The proposed Baseline Assessments are projected to lead to the identification of approximately 1,440 releases, of which 23% are projected to have groundwater impacts and the remaining 77% are projected to be soil-only impacts. The cost of cleanup for these releases will depend on the standard applied for each cleanup. The following chart describes the expected cost of cleanup by cleanup standard for these sites:

Arizona Department of Environmental Quality
Cost of Cleanup for Releases Identified through Baseline Assessments
As of May 1, 2014

Cleanup Standard	Cost
Tier 1	$72,865,645
Tier 2	$71,998,937
Tier 3	$71,812,867

The number of releases projected to be identified through Baseline Assessments corresponds to 22.6% of open tanks. This estimate of 22.6% is based on several factors. First, ADEQ data indicates the potential for a significant "backlog" of claims as a result of decreased reporting post-2006. Second, as compared with historical periods in which releases were identified typically through detection of Total Petroleum Hydrocarbons ("TPH"), current standards also require the identification of releases as a result of a broader array of Chemicals of Concern ("COC"). In addition, improvements in soil analysis have made measurements more accurate and have lowered detection limits. Finally, the specific number of releases identified does not mean that 1,440 sites will be identified as having had releases. Rather, some sites may have multiple releases. Historically, there have been 2.03 releases reported per site that

experiences releases. So this implies that releases will be identified at approximately 30% (= [1,440 / 2.03] / 2,343) of sites.

The specific value of 22.6% was determined based on an analysis of the number of reported releases (i.e., unique site-report date combinations) historically compared to the total universe of active or closed tanks. This amount was based on ADEQ historical data only, and was chosen as the most representative number of anticipated riskiness of UST sites in Arizona. However, this value is confirmed by EPA nation-wide estimates of a 22% release rate for tanks, as well as internal ADEQ estimates.

Removal of Tanks at Request of Owner / Operator

The following chart presents our projections of the number of tanks that will be removed each year at the request of owners or operators as well as the cost of removing the tanks:

Arizona Department of Environmental Quality
Cost of Removal of Tanks at Request of Owner or Operator
As of May 1, 2014

Year	Number Removed	Cost
2015	150	$1,375,580
2016	147	$1,370,397
2017	150	$1,432,843
2018	147	$1,429,865
2019	146	$1,452,479
2020-2024	784	$8,164,300
2025-2029	835	$9,607,499
2030-2035	892	$11,323,674
Total	**3,251**	**$36,156,637**

Real costs are projected assuming a 2% inflation rate per annum.

Some tanks currently in use may be very old or of low quality, and therefore may not reflect the state of the art in terms of construction materials or construction types. In some cases, these lower-quality or older tanks may be at an increased risk for leaking. For instance, T&M has been informed that single-walled fiberglass-reinforced plastic ("FRP") tanks have shown a potential for leaks by dividing along tank seams. In addition, there is some speculation within the petroleum industry that upcoming changes to fuel additives (particularly ULSG and ULSD) may have the potential to exacerbate these issues.

Therefore, it may be prudent for the ADEQ to subsidize the removal of such tanks. Removal of these tanks should reduce the risk of future leaks within the state. Removal of these potentially leak prone tanks would ultimately reduce the risk of leakage, and could have the effect of dramatically reducing the ultimate losses paid in the future.

However, removal of tanks at the request of the owner or operator would only be partially effective unless the system is replaced in its entirety. Historically, some single-walled tanks were removed and replaced with upgraded tanks, but the piping was not upgraded at the same time. In other cases, double-walled tanks were connected to mismatched single-walled piping. While replacing the tank had the effect of reducing the likelihood of a leak from the tank itself, the failure to properly upgrade piping at the same time meant that this reduction in the risk of future leakage was smaller than anticipated.

The costs reflected in the chart above do not include estimates for removal of piping. If the SAF pursues a program of subsidizing tank removals, it may be advisable that the SAF also subsidize the removal of piping to prevent the use of older, mismatched piping with newly

installed tanks. In addition, subsidizing the removal of tanks makes little sense if the owner or operator intends to replace the tank with another low-quality tank. Since January 1, 2009, the ADEQ requires that all newly installed tanks be double-walled. However, it may be appropriate for a program of tank removals to require that any replacements meet more stringent standards set by the ADEQ in order to qualify for subsidies.

Corrective Action for Releases Identified through Tank Removal

Historically, 6.5% of tank removals have resulted in identification of releases. However, the majority of these identifications occurred prior to 2001. Subsequent to 2001, an average of 1.7% of tank removals per year have been associated with the discovery of releases. T&M has assumed that 4.4% of future tank removals will result in identification of releases. Based on this assumption, T&M anticipates approximately 46 releases to be identified through tank closures from 2015 through 2035. The following chart describes the cost of cleanup by cleanup standard associated with releases identified through tank closures:

Arizona Department of Environmental Quality
2015-2035 Total Cost of Cleanup for Releases Identified through Tank Removals
As of May 1, 2014

Cleanup Standard	Cost
Tier 1	$7,253,908
Tier 2	$7,167,625
Tier 3	$7,149,102

If Baseline Assessments (or a similar process) are not performed, the cost of remediating releases discovered by tank removal might be expected to increase sharply.

Other Future Corrective Action Costs

We were asked as part of this project to estimate the costs of all future liabilities, including corrective action expenses for unidentified releases not discovered through Baseline Assessments. This is problematic, insofar as Baseline Assessments, performed at every site, are likely to detect the majority of releases that have occurred at the time of testing.

The particular timeline by which the Baseline Assessments at 2,343 sites will be performed is likely to significantly impact the likelihood that releases will be identified through Baseline Assessments or through other means. Moreover, it is unclear the extent to which Baseline Assessments are necessary to detect leaks, i.e. it is possible that actions like pressure testing of lines may be adequate to detect the vast majority of releases. Thus, the exact method by which leaks are detected will depend on the strategy pursued by the ADEQ: if the ADEQ adopts a full financial responsibility mechanism and does not choose to do Baseline Assessments, more leaks will be detected by other means than by Baseline Assessments.

Finally, the exact type of Baseline Assessments to be performed may impact the likelihood of detecting releases at each site. In particular, a set number of borings performed at each site may be redundant for some small sites but inadequate at large sites to detect all potential releases. In addition, Enhanced Leak Detection ("ELD") technologies may have the potential to identify small leaks that would not have been identifiable through traditional Baseline Assessments. It is important to note, however, that ELD technologies may not have the ability to detect prior leaks (i.e., leaks that are not from currently leaking tanks).

For these reasons, it should be noted that the division of releases between those detected via Baseline Assessments and those detected through other means is artificial. For the purposes of this projection, T&M has assumed that 90% of releases *not* identified via tank removal will be detected through Baseline Assessments. The remaining 10% will be identified through other means. We anticipate 104 releases will be identified this way between 2015 and 2035. The cost of cleanup for these releases depends on the cleanup standard applied to each cleanup. The following chart describes the anticipated cost of cleanup by type of cleanup standard for these releases:

Arizona Department of Environmental Quality
2015-2035 Total Cost of Cleanup for Releases Identified through Other Means
As of May 1, 2014

cleanup Standard	Cost
Tier 1	$21,569,782
Tier 2	$21,313,218
Tier 3	$21,258,137

The following chart describes the expected costs, by year, for cleanup of all anticipated releases from 2015 through 2035:

Arizona Department of Environmental Quality
2015-2035 Total Cost of Cleanup for All Anticipated Releases
As of May 1, 2014

Year	Number of Releases	Tier 1 Cleanup Cost	Tier 2 Cleanup Cost	Tier 3 Cleanup Cost
2015	445	$22,506,074	$22,238,373	$22,180,901
2016	422	$21,342,355	$21,088,497	$21,033,997
2017	400	$20,220,517	$19,980,002	$19,928,367
2018	378	$19,124,577	$18,897,097	$18,848,261
2019	24	$1,198,028	$1,183,778	$1,180,719
2020-2024	117	$5,942,038	$5,871,360	$5,856,186
2025-2029	114	$5,766,838	$5,698,244	$5,683,518
2030-2035	110	$5,588,907	$5,522,429	$5,508,157
Total	**2,010**	**$101,689,335**	**$100,479,780**	**$100,220,106**

Anticipated UST Fund Cash Flows by Year

T&M was asked to project the cash flows to the UST fund each fiscal year. The following chart shows the expected amounts paid each year for cleanup costs to a Tier 1 cleanup standard, Baseline Assessments, and anticipated tank removals:

Arizona Department of Environmental Quality
Anticipated UST Fund Cash Flows By Year
As of May 1, 2014

Fiscal Year	Tier 1 Cost of Cleanup	Baseline Assessments	Tank Removals	Total Cash Flow
2015	$20,433,780	$9,122,994	$1,375,580	$30,932,354
2016	$9,264,374	$9,122,994	$1,370,397	$19,757,764
2017	$8,442,394	$9,122,994	$1,432,843	$18,998,231
2018	$8,900,342	$9,122,994	$1,429,865	$19,453,201
2019	$9,507,868	$0	$1,452,479	$10,960,347
2020-2024	$40,133,855	$0	$8,164,300	$48,298,155
2025-2029	$26,471,297	$0	$9,607,499	$36,078,796
2030-2034	$16,279,578	$0	$11,323,674	$27,603,252
Total	**$139,433,488**	**$36,491,975**	**$36,156,637**	**$212,082,100**

Staff Requirements for New Corrective Action Program

Staff requirements for the new corrective action program will depend on the way the program is structured. As the structure of the new program has yet to be determined, estimates of staffing requirements have not yet been completed.

Annual Revenue Projections and Pro Forma Financials

The following chart shows anticipated Underground Storage Tank Fund balances by year from 2015 through 2035 based on the proposed corrective action program, including cost of subsidizing removal of underground storage tanks and performing Baseline Assessments, but

not including the effect of deductibles and assuming no investment income. This chart does not include amounts related to the Regulated Substance Fund:

Arizona Department of Environmental Quality
UST Fund Financial Projections By Year
As of May 1, 2014

Fiscal Year	Net Revenue	Corrective Action Costs	Other Expenses	Beginning Balance	Ending Balance
2015	$14,429,500	$20,433,780	$17,029,574	$379,000	**($22,654,854)**
2016	$28,800,000	$9,264,374	$17,024,390	($22,654,854)	**($20,143,618)**
2017	$28,800,000	$8,442,394	$17,217,457	($20,143,618)	**($17,003,469)**
2018	$28,800,000	$8,900,342	$17,347,711	($17,003,469)	**($14,451,522)**
2019	$28,800,000	$9,507,868	$8,383,229	($14,451,522)	**($3,542,619)**
2020-2024	$139,680,000	$40,133,855	$44,576,812	($3,542,619)	**$51,426,715**
2025-2029	$132,480,000	$26,471,297	$49,809,854	$51,426,715	**$107,625,564**
2030-2034	$125,280,000	$16,279,578	$55,710,322	$107,625,564	**$160,915,664**

Please note: This study was contracted at the end of Fiscal Year 2014, and the data sets used represent information available at that time, assuming implementation of proposed program components in Fiscal Year 2015. Delays in implementation may alter projections per fiscal year.

If annual revenues continue at $0.01 per gallon and the coverage provided by the program does not change from the status quo, the fund balance will increase in the future.

Several things should be noted with respect to the values shown in the above chart. First, "other expense" is equal to the sum of staffing and other expenses (e.g., personal services and related benefits, professional and outside services, travel, other operating and equipment expenses), costs of subsidizing tank removals, and cost of performing Baseline Assessments. Staffing and other expenses are based on projections provided by the ADEQ and are equal to

$6,531,000 for 2015 and 2016. These expenses are trended at 2% for inflation starting in 2017.

Revenues are based on projections provided by the ADEQ of $2.4 million in tax revenues per month. After 2020, these revenues are trended downward at 1.0% per year to reflect anticipated decreases in fuel usage as a result of improvements in fuel efficiency of vehicles and similar effects. Net revenues in fiscal years 2015 and prior are reduced due to transfers out of the UST Fund. These amounts are transferred to the Regulated Substances Fund and other funds. In fiscal year 2013 and fiscal year 2014, transfers out of the fund totaled $50,480,000 and $21,843,700, respectively. It is anticipated that $14,370,500 will be transferred out of the fund in fiscal year 2015. Transfers out of the UST Fund are assumed to end on January 1, 2015, and are $0 per year thereafter.

Note that the projected expenses, cleanup costs, and revenues may depend on the structure of the future SAF program. Further research will be required to determine how fund financials may change in response to different program structures.

Cost Savings from Deductibles

The following chart describes the anticipated savings to the ADEQ, from 2015 through 2035, from the application of deductibles of various sizes. These cost savings from deductibles are not included in any other financial projections provided in this report. It should be noted that because Baseline Assessments are projected to cost on average $15,575 per site, deductibles in excess of $15,575 would likely mean that the owner or operator would cover the entire

expense. These results do not contemplate a "mix and match" approach whereby the deductible for removal of a tank or for a Baseline Assessment differs from the deductible for corrective action in the event that a leak is identified.

Arizona Department of Environmental Quality
Anticipated Benefit from Application of Deductibles from 2015-2035
As of May 1, 2014

Deductible	Tank Removal	Baseline Assessments	Tier 1 Cleanup	Tier 2 Cleanup	Tier 3 Cleanup
2,500	3,789,035	5,857,500	2,520,870	2,520,258	2,519,320
5,000	7,578,069	11,715,000	4,941,872	4,940,388	4,938,156
7,500	11,367,104	17,572,500	7,225,656	7,222,449	7,219,258
10,000	15,156,138	23,430,000	9,364,047	9,359,082	9,354,913
12,500	18,945,173	29,287,500	11,351,350	11,344,052	11,339,082
15,000	22,734,207	35,145,000	13,216,222	13,206,886	13,200,167
17,500	26,523,242	36,491,975	14,976,363	14,965,335	14,948,707
20,000	30,312,277	36,491,975	16,635,826	16,620,760	16,590,467

The following chart shows the anticipated total savings (i.e., the savings for tank removals, Baseline Assessments, and cleanup combined) for each level of deductible contingent on the cleanup standard applied:

Arizona Department of Environmental Quality
Anticipated Total Benefit from Application of Deductibles from 2015-2035
As of May 1, 2014

Deductible	Tier 1 Cleanup	Tier 2 Cleanup	Tier 3 Cleanup
2,500	12,167,404	12,166,792	12,165,855
5,000	24,234,941	24,233,457	24,231,225
7,500	36,165,260	36,162,053	36,158,861
10,000	47,950,185	47,945,220	47,941,051
12,500	59,584,023	59,576,725	59,571,755
15,000	71,095,429	71,086,094	71,079,375
17,500	77,991,580	77,980,552	77,963,925
20,000	83,440,078	83,425,011	83,394,719

The majority of the cost savings would come from application of a deductible to tank removal. The following chart shows the anticipated annual percentage savings from the application of a deductible for each activity:

Arizona Department of Environmental Quality
Anticipated Benefit from Application of Deductibles from 2015-2035
As of May 1, 2014

Deductible	Tank Removal	Baseline Assessments	Tier 1 Cleanup	Tier 2 Cleanup	Tier 3 Cleanup
2,500	10%	16%	4%	4%	4%
5,000	21%	32%	7%	8%	8%
7,500	31%	48%	11%	12%	12%
10,000	42%	64%	14%	15%	16%
12,500	52%	80%	17%	19%	19%
15,000	63%	96%	20%	22%	22%
17,500	73%	100%	23%	25%	25%
20,000	84%	100%	25%	27%	28%

The percent savings also gives a good approximation of the percent of single-year savings from the application of a deductible to each activity. For instance, a deductible of $5,000 would save approximately 15% on the total cost of tank removals each year.

Full Financial Responsibility Mechanism

The investigation and discussion of the ADEQ providing a full financial responsibility answer for the State has been deferred until the second phase of this project is undertaken.

Recommendations

Databases Should Be Combined

The databases of tank information, release information, and payment information should be combined into a single relational database.

Using the current set of databases, it is not possible to associate individual losses paid to individual release reports in a direct manner as the database of payments made by the ADEQ is separate from the database of releases reported to the ADEQ. Moreover, information about individual tanks (construction, materials, pipes, install dates) was captured in yet a third database. This multitude of separate databases makes it difficult to pull together the information necessary for estimating the ultimate liability associated with a specific leak. Future studies will be greatly hindered by the lack of a single relational database. This change will benefit management of the fund, as management tasks are complicated by a lack of a single, central source of information about outstanding and historical liabilities. T&M stands ready to assist the ADEQ with this the design of the database should it choose to proceed.

History of Priority Levels Should Be Captured

Cleanup priority codes on individual claims change over time as more information is gathered during the life of the claim. Capturing the history of priority codes for each claim over time should be captured as a data element to provide more complete information on cost estimation. Historical data should be back-filled with the history of priority codes for each claim, if possible.

The reason for this recommendation is that the current database that includes the history of releases does not include a history of priority levels assigned to individual releases as they were reported. This information is useful in estimating the ultimate cost of future claims. For

instance, it would be useful to learn the likelihood that a claim of a given priority code will change to a different priority code over time, e.g. the likelihood that a Priority 2 claim will become Priority 1 before proceeding to a code corresponding to a cleaned up claim. T&M stands ready to assist the ADEQ with this task should it choose to proceed.

Excluded Facilities Should Be Indicated

The databases currently in use by the ADEQ do not indicate if a given facility was covered by the SAF. In the process of performing the projections described in this report, it was necessary to manually remove each facility deemed to be not covered under the program, i.e., Federal and State Government tank locations. In the future, T&M recommends that a variable be included in each database indicating whether or not coverage is provided at each facility, or that the facilities that are not included be kept separately in the database. T&M stands ready to assist the ADEQ with this task should it choose to proceed.

Report Distribution and Use

This report has been prepared for internal use by the management of the ADEQ, their accountants, auditors, and attorneys and the Arizona State Legislature UST Study Committee. This report may be reproduced only in its entirety. The Exhibits and Appendices are integral parts of this report. Other distribution or use of this report by the ADEQ management or related parties described above is not authorized without the prior written permission of Taylor & Mulder, Incorporated. The ADEQ is not authorized to include this report in any marketing or request for proposal solicitations. In addition, it should be understood that T&M consultants are available to respond to any questions by authorized third parties with respect to this report.

Conditions and Limitations

The analyses contained in this report were performed using accepted loss and loss adjustment expense reserving methods adjusted to the special needs of the ADEQ and in conformance with sound actuarial standards and principles. T&M introduced assumptions and judgments that we considered appropriate in the circumstances.

With regard to projections of ultimate values, it should be understood that the emergence and settlement of claims and the associated expenses are subject to uncertainty. While we have used our best professional judgment in all instances, projections of future ultimate losses and loss expenses are inherently uncertain because of the random nature of claims occurrences. They are also dependent upon future contingent events and are affected by many additional factors.

ADEQ claim reserving procedures and settlement philosophy, current and perceived social and economic inflation, current and future court and jury attitudes, legislative changes affecting the ADEQ, improvements in technology, and many other economic, legal, political, legislative and social factors all can have significant effects on ultimate claim costs and other projections contained in this report. Therefore, we cannot warrant that actual developments will not differ from current projections. Such differences could be upward or downward and could be significant.

In summary, the ultimate loss and loss adjustment expense levels estimated in this report are subject to potential variations in estimation due to:

(1) the fact that the ultimate liability of the ADEQ is subject to the outcome of events yet to occur;
(2) the unanticipated changes in the legal, economic, legislative or claims adjudication environments;
(3) statistical fluctuation in losses around the estimated or expected values when all other factors remain constant;
(4) the fact that the actual future loss and loss payment and reporting patterns may differ from those applied in the determination of the expected losses; and
(5) There may be unanticipated changes in the loss and expense loss and expense payment and reporting patterns which would impact the current estimates.

Accordingly no assurance can be given that future loss emergence will not deviate from the estimated ultimate loss and loss adjustment expenses. However, the ultimate loss and loss adjustment expense estimates were based on a reasonable application of generally accepted actuarial procedures and techniques applied to the information available.

We reviewed the information for overall reasonableness and presented any irregularities to the ADEQ third-party administrator for edification and clarification.

T&M relied without audit or verification on historical loss, loss adjustment expense, exposure data, and other information provided by the ADEQ and its employees. T&M has relied upon the data provided and on the oral and/or written statements made regarding the quality, accuracy, and completeness of the data and information supplied. Any inaccuracies or inconsistencies in the data could have a significant effect on the conclusions drawn.

Should any inaccuracies be found in the data, T&M should be notified immediately so that the analysis can be adjusted accordingly.

With regard to projections of estimated revenues, it should be understood that the revenue streams are subject to uncertainty. While we have used our best professional judgment in all instances, projections of future revenues are inherently uncertain due to potential changes in technology, the implementation of environmental requirements, the introduction of alternative vehicle fuels, and changes in the economy, among others. While T&M has used its best judgment in selecting trend values for each category of revenue, actual revenue collected is dependent upon unknown future events and may be affected by additional factors outside of the ADEQ's control.

The analysis in this report was limited to the loss and loss adjustment expense items noted in the scope of this project. This report does not include an examination of the assets of the ADEQ, nor did we form any opinion as to the value or validity of the assets. This report does not include a review or analysis of any income statement or other balance sheet items. This analysis with respect to loss and loss adjustment expense reserves is based upon the assumption that all claim reserves are backed by valid assets and that these assets reflect suitably scheduled maturities and/or sufficient liquidity to meet cash flow requirements.

This report is limited to the scope described in the Purpose and Scope section. It includes projections regarding cash flow of the operations of the ADEQ under certain narrow assumptions and conditions.

This report was prepared for use by persons technically competent in insurance financial matters. Persons receiving this report should be made aware of the availability of T&M, Inc. personnel to answer questions and/or amplify on any matter addressed therein.

Actuarial Analysis

Sources of Data

Data used in this analysis were provided by ADEQ. Data used included:

1. Tank "autopsy" reports detailing the types of tanks and sites, as well as statistical breakdown of releases based on various factors;
2. Historical tank listing, including tank install and closure dates by facility, dates of reported releases, and tank and piping construction information;
3. LUST listing, including all currently known reported LUSTs, current priority code, and facility information;
4. Payment information, arranged by facility:
5. Estimates of costs associated with performing Baseline Assessments and tank closures;
6. Partial soil information by facility, including depth to groundwater; and
7. The previous actuarial study, performed as of October 1, 2001.

Adjustments to Data

Historical statistical information provided for use in the actuarial study was derived from many different sources. Problematically, loss payment information was not tied to individual release reports, but to sites. Therefore, it was not possible to accurately characterize the cost of remediation for many releases based on specific tank characteristics. For example, if a single site experienced two releases, it was not possible to determine directly how much was spent on remediation for each individual release. Moreover, payments made by the SAF were often reimbursements to tank owners / operators for remediation work already performed and paid for by the owner / operator. As a result, payments were often made after claims were closed. Thus, in the example of a single site with two releases, even if one release was closed and the other open when a payment was made, it was not strictly possible to determine from the data whether that payment related to the open or closed claim.

To accurately project losses for each release and each level of cleanup standard, it was necessary to allocate losses to individual releases. In this case, a release is defined as a unique release date at a unique facility. For instance, if a single facility had three leaks reported on January 1, that was treated as a single leak. If a single facility had a leak reported on January 1 and another on August 1, that was treated as two leaks.

This allocation of payments to releases was done by assigning to each release at a given facility a normalized weight at each payment date. If a payment occurred during the period that a given release was still open, that release received a weight of 1.0. If the payment occurred before the release occurred, the release received a weight of 0.0. If the payment occurred after a release was closed, the release received a weight based on the length of time that elapsed since closure of the claim. The weight assignment was performed using an arc-cotangent function, which provided a smooth descent asymptotically from a weight of 1.0 to 0.0.

The arc-cotangent function was adjusted based on the average length of time from the final claim closure at a site to the payments subsequent to the final closure. That is, for sites with all claims closed, in many cases payments occurred after the final closure. The average time from the final closure to these post-closure payments was 2.966 years. The arc-cotangent function was therefore adjusted so that after 2.966 years the weight assigned to the release was 0.5, declining asymptotically to zero after that.

After determining weights, the weights were normalized to sum to one. We applied the payments to each release at each site based on these normalized weights.

For each claim open as of the evaluation date, the expected time to closure of that claim was estimated using an exponential model of claim reporting. One standard method of predicting occurrences of random events distributed across time is a Poisson model, which assumes that event occurrences are Poisson distributed. This, in turn, means that the time remaining until the event is expected to occur is exponentially distributed. Expected time until closure of claims was therefore estimated based on the memory-less property of the exponential distribution, namely that the expected time until closure for currently open claims is equal to the expected time until closure of all claims.

Overall Methodology

Loss Model

Projections of ultimate losses were made using two generalized linear models: one for losses prior to June 30, 2006 (the "pre-2006 model"), and one for losses July 1, 2006 and subsequent ("post-2006"). In each case, a multitude of factors were considered as possible drivers of ultimate losses, including:

- Soil composition at each facility,
- Depth to groundwater at each facility,
- Tank construction and materials at each facility,
- Pipe construction and materials at each facility,
- Number of releases at a given facility,
- Geo-social information coded by county,

- Soil-only versus groundwater contamination,
- Cost of cleanup to different tiers,
- Length of time from the report date of a release to closure or expected closure,
- Report year,
- Amounts paid within the first 72 months after the report of a claim (only applies to losses pre-2006); and,
- Interaction terms for the above factors, i.e., terms measuring the combined effect of multiple of the above factors changing in unison. For instance, if groundwater contamination contributed more to severity of claims in Maricopa County than in other counties, this would be captured by an interaction term.

For the pre-2006 model, losses paid in the first 72 months after claim report were used as part of predicting ultimate losses. All claims from 2005 and prior had experienced payments for *at least* 72 months, and losses experienced in the first 72 months were a good predictor of ultimate losses expected to be paid for each claim. For post-2006 releases, this factor was not available, as releases subsequent to July 1, 2006 had not experienced any payments to date. Calculating the ultimate cost of these releases involved relying more heavily on the other factors described above.

In each case, all sensible combinations of factors were tested using a generalized linear model with a Gaussian probability distribution and an identity link function. This model provided the best fit of all models tested. Other models tested included the use of a gamma probability distribution, an inverse Gaussian, a Tweedie distribution, and a Tobit distribution. These were tested in conjunction with log-link functions, identity link functions, and inverse link functions. The Gaussian probability distribution with identity link provided the best fit.

The results of these two models (pre-2006 and post-2006) were two functions describing expected ultimate losses based on information available for each claim. The function describing expected ultimate loss for a claim prior to June 30, 2006 is:

$$\$61{,}612 + .7055 * \text{Paid at 72 Months}$$
$$+ \$7{,}167 * \textit{Expected Years Open}$$
$$- \$48{,}185 * \textit{Soil Only Claim}$$
$$- \$31{,}026 * \textit{Tier } 1 - \$45{,}608 * \textit{Tier } 2 - \$47{,}883 * \textit{Tier } 3$$
$$+ 0.0520 * \textit{Paid at } 72 \textit{ Months} * \textit{Years Open}$$

In this equation, the values of "Soil-Only Claim," "Tier 1," "Tier 2," "Tier 3," take on a value of 0.0 or 1.0 depending on the details of the needed evaluation. If a claim is going to be closed to Tier 1 standard, for instance, then "Tier 1" is 1 and "Tier 2" and "Tier 3" are set to 0.0.

So, for example, a claim was reported at Facility ID 0-000068 on 2/1/1994. The claim is still open, and the impact is believed to be soil-only. To date, $0 has been paid on this claim. The claim is expected to be open for 25.78 years before closure. So, the calculation for the projected ultimate cost of the claim if it were closed to Tier 1 standard is given by the following formula:

$$\$61{,}612 + .7055 * 0 + \$7{,}167 * 25.78 - \$48{,}185 * 1 - \$31{,}026 * 1 - \$45{,}608 * 0 - \$47{,}883 * 0$$
$$+ \ 0.0520 * 0 * 25.78 = \$167{,}137$$

Thus, the expected cost of closing this claim to a Tier 1 cleanup standard is $167,137.

The function describing the expected ultimate loss for a claim after July 1, 2006 is:

$$\$112{,}127 + \$4{,}913 * Years\ Open - \$104{,}164 * Soil\ Only - \$114{,}563 * Tier\ 1 - \$122{,}964$$
$$* Tier\ 2 - \$129{,}100 * Tier\ 3 + \$118{,}341 * Apache\ County + \$108{,}695$$
$$* Cochise\ Cty + \$99{,}342 * Coconino\ Cty + \$100{,}351 * Gila\ Cty + \$120{,}475$$
$$* Graham\ Cty + \$73{,}630 * Greenlee\ Cty + \$78{,}747 * La\ Paz\ Cty + \$107{,}742$$
$$* Maricopa\ Cty + \$120{,}621 * Mohave\ Cty + \$96{,}350 * Navajo\ Cty + \$109{,}551$$
$$* Pima\ Cty + \$105{,}310 * Pinal\ Cty + \$94{,}025 * Santa\ Cruz\ Cty + \$88{,}299$$
$$* Yavapai\ Cty + \$107{,}652 * Yuma\ Cty$$

This model operates in the same manner as the pre-2006 model. The factor used for a given county is set at 1.0 if the release occurred in that county and 0 otherwise. In the event that an individual county is not listed for a release, a weighted average of the coefficients for the counties is used, weighted by the number of releases per county. This factor was calculated as $106,424.

It is notable that when counties were included in the analysis, the factors for the soil type and water depth at a facility were no longer statistically significant. One interpretation for this observation is that different counties may have different average geophysical properties. Thus, the soil type and water depth information was redundant when considered against

broader geographic information. It is likely that if greater amounts of soil and water depth information was available (i.e., for every facility), that information would produce superior results to the use of counties as coding for geophysical characteristics. However, since there is a greater amount of county information, it produces more statistically significant results in this case.

By way of interpreting the results of these models, it is helpful to consider the meaning of the coefficients. For instance, in both models, the amount subtracted from the ultimate loss for a Tier 1 closure is smaller than the amount subtracted for a Tier 2 or Tier 3 closure. This implies that Tier 1 is more costly on average than Tier 2 and Tier 3 (which comports with common sense). Also, the coefficient for the number of years a claim is open is a positive number. In the case of the pre-2006 model, for instance, this implies that holding all else equal, each year a claim remains open it costs $7,167 more on average.

These functions were applied to each claim individually for each anticipated tier of cleanup. For example, to determine the cost of cleanup to Tier 1 standards, the projections were performed by substituting in the factor for Tier 1 cleanup for every open claim. A similar procedure was done for Tier 2 and Tier 3. The resulting values were set to be at least as large as the amount of losses paid to date, in the event that the model predicted ultimate losses lower than paid-to-date losses.

The result of these equations was a set of expected losses based on cleanup to Tier 1, Tier 2, and Tier 3 standards. These losses were determined on the level of individual release dates and individual sites, and are summarized by release report dates in Exhibits 1-4.

Baseline Assessments for UST Sites

Projections of the cost of performing Baseline Assessments were calculated by multiplying the number of sites with non-permanently closed storage tanks by the expected cost per site for Baseline Assessments.

The cost for a Baseline Assessment depends on the actual type of assessment to be employed at each site. For this project, we were asked to determine the cost per site for Baseline Assessments assuming:

a) Ten vertical borings per site,
b) Four vertical borings and two angle borings per site, or
c) Four vertical borings per site.

To determine the ultimate cost of these types of assessments, we determined the cost per foot for a vertical boring. This was assumed to be $13.17 per foot. The cost per angle boring was assumed to be $3.50 more per foot. The depth of vertical borings was assumed to be 30 feet, while the depth of angle borings was assumed to be 82 feet based on historical angle borings.

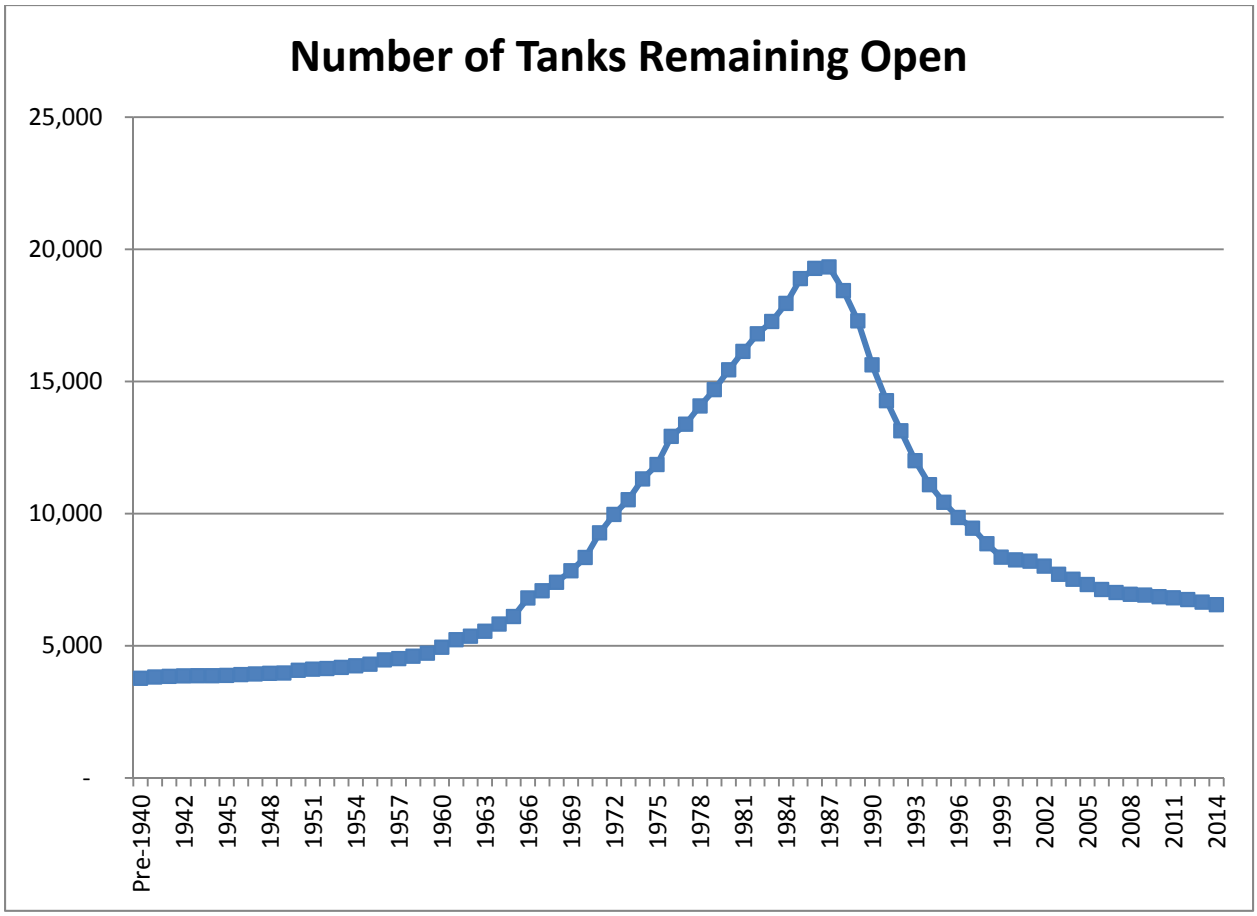
These values were combined with expected additional expenses for performance of the Baseline Assessments. These additional expenses include labor, equipment, subcontractor costs (including soil sampling lab fees), and miscellaneous other costs. Together, the additional expenses per site were estimated to run $12,239. These additional expenses make up the bulk of the cost of performing Baseline Assessments.

Together, the cost for the borings plus the additional costs were added together and multiplied by the number of sites with tanks that have not all been permanently closed to determine the total cost for Baseline Assessments.

Removal of Tanks at Request of Owner / Operator

To project the cost of removing underground storage tanks at the request of the owner or operator, it was first necessary to estimate the number of tanks that would be removed this way. This was accomplished by projecting the number of tanks to be added each year as well as the number of tanks to be removed each year.

The following chart shows the number of tanks remaining open each year for the historical period:



The number of open tanks peaked in the mid-to-late 1980s and declined quickly thereafter. Starting in the year 2000, the number of tanks removed each year has declined considerably. For this reason, tanks expected to be removed in the future were projected based on an exponential growth model fit to the years 2000 through 2014.

Cost for removal of tanks is based partly on the size of the tanks being removed. For this reason, it was necessary to also project the size of tanks expected to be removed in the future. This was done based on analyzing the average size of tanks being installed each year and the average length of time a storage tank is in the ground. Our analysis showed that from installation to permanent closure, tanks were in the ground an average of 22.03 years. This

allowed us to project the size of tanks expected to be removed in the future by considering the size of tanks being installed 22.03 years prior and interpolating.

The expected cost per tank (on average) was then estimated based on the average size of tanks expected to be removed in each year. This amount was trended into the future at a rate of 2.0% per annum for expected inflation (the Federal Reserve annual inflation target).

The number of tanks expected to be removed multiplied by the expected cost per tank for removal yielded the expected cost of tank removals at the request of owners or operators.

Cost of Cleanup for Releases Identified through Baseline Assessments and Tank Removal

The proposed Baseline Assessments and removal of tanks at the request of owners or operators are likely to result in the identification of petroleum releases that had previously gone unreported or undiscovered. Referring to the scope section of this report, sections 4, 6, and 7 request that T&M estimate the cost of cleanup to the different cleanup standards for the future releases identified through these methods or other methods.

Problematically, if the proposed Baseline Assessments are performed at every site for which there are tanks remaining that have not been permanently closed, and the intent of the Baseline Assessments is to identify releases, it is unlikely that releases will be identified through means *other than* Baseline Assessments if they have not already been identified. For this reason, the bulk of expected future releases are anticipated to be identified through the proposed Baseline Assessments.

The expected number of releases identified in the future was projected in two parts. First, the number of releases identified through claim closure was projected. For the purposes of this estimate, releases in which the release date coincided with the removal of a storage tank were assumed to be releases identified during tank removal. This number of releases identified through tank removals in each year was compared with the total number of tank removals each year to determine the likelihood that any given removal would result in the identification of a release.

We reviewed the average likelihood for a 5-year average, 10-year average, 15-year average, and an all-year average and selected a likelihood of identifying releases that we expect will be predictive of future experience. This likelihood was then multiplied by the number of projected tank closures each year to determine the projected number of releases identified by means of tank closures. For example, in 2015, we project that 150 tank closures will take place. At a projected 4.4% of closures resulting in releases, this means a projected 150 x 4.4% = 6.6 releases will be identified through closures in 2015.

The second piece of the projection was the number of releases identified in open tanks that would not be identified by Baseline Assessments. This was done by comparing the number of releases identified *not* through tank closure to the number of open tanks each year to establish the rate of reporting of releases based on the exposures of the universe of open tanks. This yielded an expected number of releases per thousand open tanks per year.

Again, we reviewed the average number of releases based on a 5-year, 10-year, 15-year, and an all-year average and selected a number of expected releases per open tank that we expect will be predictive of future experience. This number of releases per open tank was multiplied by the projected number of open tanks each year to determine the number of projected releases not identified through tank closures or Baseline Assessments. This value was trended downward over the first four years to reflect the fact that Baseline Assessments would identify many releases before they are observed through other means. For 2015, this is calculated as 6,475 open tanks multiplied by a projected 11.12 reported releases per 1,000 open tanks, which yields 72.0 releases. For 2016, the projected 6,400 open tanks are multiplied by 11.12 reported releases per 1,000 tanks and then multiplied by 75% to reflect the effects of Baseline Assessments, yielding 53.4 releases.

Finally, we projected the number of releases anticipated to be identified through Baseline Assessments. This was done by comparing the historical number of releases to the number of active or closed tanks over the same period. Since 1984, there have been 6,023 unique release dates at unique sites for 26,621 active or closed tanks over that period. This yields an estimated 22.6% leak rate for each individual tank. This number was compared with ADEQ internal estimates and EPA nation-wide estimates. The EPA national estimate is 22% leak rate per tank. This selection was also made in consideration of the apparent drop in release reporting starting in 2006.

This 22.6% was multiplied by the number of open tanks projected for each year. In 2015, the projected 6,475 open tanks were multiplied by 22.6% and again multiplied by 25% to reflect

the fact that Baseline Assessments are expected to take place over four years. This yields an anticipated 366 to be reported in 2015 as a result of Baseline Assessments.

These results are summarized in Exhibits 12-13.

Finally, the percentage of releases expected to impact groundwater was estimated. We reviewed the percentage of groundwater impacts each year from 1984 through 2014 and reviewed the 5-year, 10-year, 15-year, and all-year average percent of groundwater impacts. This amount is relatively stable from year to year, with groundwater-impacts typically ranging from 11% to 37%.

Based on the expected future percent of groundwater impacts each year, we determined the cost of cleanup for releases identified through all methods. This was performed by determining the average cost of cleanup for soil-only impacts and groundwater impacts at Tier 1, 2, and 3 cleanup standards. This analysis implied that the average cost of cleanup for a groundwater impact is between 8 and 9 times higher than the average cost of cleanup for a soil-only impact.

The average cost of cleanup for soil-only and groundwater cleanups multiplied by the expected number of soil-only releases and groundwater releases identified through all methods yielded the expected total cost of cleanup for releases to be identified in the future.

These results are summarized in Exhibits 12 and 14-17.

Cost Savings from Deductibles

Cost savings from the application of deductibles were determined separately for the expected cost of corrective actions, the expected cost of tank removals, and the expected cost of performing Baseline Assessments.

To determine the benefit of applying a deductible to the expected cost of corrective actions, we analyzed the hypothetical savings that would have been obtained if historical business had included the application of the deductible. This yielded an approximate percentage savings from the application of the deductible at each level. This was multiplied by the anticipated future costs of corrective actions to determine the total expected savings from various levels of deductible.

For the expected cost of tank removals and the expected cost of performing Baseline Assessments, the deductible was applied directly to the anticipated costs before multiplying by the number of tank removals and number of Baseline Assessments, respectively, to determine the savings from application of the deductible.

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Summary of Reserves for Reported Claims
Closure to Tier 1 Standard

(1) Report Year	(2) Ultimate Loss Excl. State Lead	(3) Total Ultimate Loss	(4) Paid Loss	(5) Unpaid Loss	(6) # Open Releases	(7) Average Reserve Per Open Claim	(8) Total # Releases	(9) Ultimate Avg Cost per Claim
1984	290,848	290,847.82	290,848	-	-	-	6	48,475
1985	3,094,462	3,094,462	2,996,346	98,116	3	32,705	25	123,778
1986	7,982,388	7,982,388	7,258,150	724,238	6	120,706	81	98,548
1987	10,318,738	10,318,738	9,766,705	552,033	6	92,005	96	107,487
1988	19,155,170	19,155,170	16,571,459	2,583,712	18	143,540	202	94,828
1989	30,134,871	30,134,871	27,969,724	2,165,147	16	135,322	371	81,226
1990	31,810,259	31,810,259	28,415,824	3,394,435	23	147,584	443	71,806
1991	32,444,343	32,444,343	28,716,619	3,727,725	26	143,374	480	67,592
1992	31,645,026	31,645,026	29,342,638	2,302,388	18	127,910	413	76,622
1993	34,697,663	34,697,663	31,905,885	2,791,778	21	132,942	536	64,734
1994	26,790,496	26,790,496	24,607,411	2,183,085	16	136,443	477	56,165
1995	33,020,015	33,020,015	30,488,609	2,531,406	18	140,634	571	57,828
1996	28,779,754	28,779,754	24,754,744	4,025,010	32	125,782	504	57,103
1997	13,063,080	13,063,080	10,762,357	2,300,723	16	143,795	303	43,112
1998	18,764,738	18,764,738	15,295,498	3,469,241	31	111,911	340	55,190
1999	14,905,008	14,905,008	12,430,242	2,474,766	23	107,599	253	58,913
2000	8,897,050	8,897,050	6,494,990	2,402,060	16	150,129	130	68,439
2001	4,593,183	4,593,183	4,110,657	482,527	9	53,614	81	56,706
2002	3,482,309	3,482,309	2,648,456	833,853	8	104,232	76	45,820
2003	3,488,811	3,488,811	2,901,472	587,339	7	83,906	94	37,115
2004	11,614,118	11,614,118	8,926,518	2,687,600	14	191,971	140	82,958
2005	6,799,882	6,799,882	5,010,383	1,789,499	10	178,950	77	88,310
2006	5,805,539	5,805,539	3,540,948	2,264,591	14	161,756	60	96,759
2007	875,606	875,606	-	875,606	7	125,087	30	29,187
2008	481,139	481,139	-	481,139	5	96,228	17	28,302
2009	651,058	651,058	-	651,058	5	130,212	26	25,041
2010	1,075,795	1,075,795	-	1,075,795	12	89,650	32	33,619
2011	1,620,072	1,620,072	-	1,620,072	18	90,004	41	39,514
2012	1,434,154	1,434,154	-	1,434,154	26	55,160	60	23,903
2013	1,294,529	1,294,529	-	1,294,529	23	56,284	35	36,987
2014	664,614	664,614	-	664,614	22	30,210	23	28,896
Total	**389,674,721**	**389,674,721**	**335,206,480**	**54,468,241**	**469**	**116,137**	**6,023**	**64,698**
Pre-6/30/06 Total	**381,038,326**	**381,038,326**	**335,206,480**	**45,831,846**	**347**	**132,080**	**5,748**	**66,291**
Post-6/30/06 Total	**8,636,395**	**8,636,395**	**-**	**8,636,395**	**122**	**70,790**	**277**	**31,178**

Notes:
Column (5) = (3) - (4)
Column (7) = (5) / (6)
Column (9) = (3) / (8)
Columns (6) and (9) define a release as the set of releases reported at a single facility on a single date

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Summary of Reserves for Reported Claims
Closure to Tier 2 Standard

(1) Report Year	(2) Ultimate Loss Excl. State Lead	(3) Total Ultimate Loss	(4) Paid Loss	(5) Unpaid Loss	(6) # Open Releases	(7) Average Reserve Per Open Claim	(8) Total # Releases	(9) Ultimate Avg Cost per Claim
1984	290,848	290,847.82	290,848	-	-	-	6	48,475
1985	3,080,833	3,080,833	2,996,346	84,487	3	28,162	25	123,233
1986	7,927,874	7,927,874	7,258,150	669,725	6	111,621	81	97,875
1987	10,277,853	10,277,853	9,766,705	511,147	6	85,191	96	107,061
1988	19,026,621	19,026,621	16,571,459	2,455,162	18	136,398	202	94,191
1989	29,970,551	29,970,551	27,969,724	2,000,827	16	125,052	371	80,783
1990	31,585,382	31,585,382	28,415,824	3,169,559	23	137,807	443	71,299
1991	32,175,714	32,175,714	28,716,619	3,459,096	26	133,042	480	67,033
1992	31,467,308	31,467,308	29,342,638	2,124,670	18	118,037	413	76,192
1993	34,493,236	34,493,236	31,905,885	2,587,351	21	123,207	536	64,353
1994	26,640,583	26,640,583	24,607,411	2,033,172	16	127,073	477	55,850
1995	32,834,315	32,834,315	30,488,609	2,345,706	18	130,317	571	57,503
1996	28,455,164	28,455,164	24,754,744	3,700,420	32	115,638	504	56,459
1997	12,899,539	12,899,539	10,762,357	2,137,182	16	133,574	303	42,573
1998	18,437,655	18,437,655	15,295,498	3,142,157	31	101,360	340	54,228
1999	14,632,438	14,632,438	12,430,242	2,202,196	23	95,748	253	57,836
2000	8,692,623	8,692,623	6,494,990	2,197,633	16	137,352	130	66,866
2001	4,520,902	4,520,902	4,110,657	410,245	9	45,583	81	55,814
2002	3,386,909	3,386,909	2,648,456	738,454	8	92,307	76	44,565
2003	3,407,040	3,407,040	2,901,472	505,568	7	72,224	94	36,245
2004	11,423,319	11,423,319	8,926,518	2,496,802	14	178,343	140	81,595
2005	6,663,597	6,663,597	5,010,383	1,653,214	10	165,321	77	86,540
2006	5,635,393	5,635,393	3,540,948	2,094,445	14	149,603	60	93,923
2007	816,349	816,349	-	816,349	7	116,621	30	27,212
2008	438,813	438,813	-	438,813	5	87,763	17	25,813
2009	608,732	608,732	-	608,732	5	121,746	26	23,413
2010	974,211	974,211	-	974,211	12	81,184	32	30,444
2011	1,467,696	1,467,696	-	1,467,696	18	81,539	41	35,797
2012	1,214,056	1,214,056	-	1,214,056	26	46,694	60	20,234
2013	1,099,827	1,099,827	-	1,099,827	23	47,819	35	31,424
2014	488,093	488,093	-	488,093	22	22,186	23	21,221
Total	**385,033,474**	**385,033,474**	**335,206,480**	**49,826,994**	**469**	**106,241**	**6,023**	**63,927**
Pre-6/30/06 Total	**377,420,133**	**377,420,133**	**335,206,480**	**42,213,653**	**347**	**121,653**	**5,748**	**65,661**
Post-6/30/06 Total	**7,613,341**	**7,613,341**	**-**	**7,613,341**	**122**	**62,404**	**277**	**27,485**

Notes:
Column (5) = (3) - (4)
Column (7) = (5) / (6)
Column (9) = (3) / (8)
Columns (6) and (9) define a release as the set of releases reported at a single facility on a single date

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Summary of Reserves for Reported Claims
Closure to Tier 3 Standard

(1) Report Year	(2) Ultimate Loss Excl. State Lead	(3) Total Ultimate Loss	(4) Paid Loss	(5) Unpaid Loss	(6) # Open Releases	(7) Average Reserve Per Open Claim	(8) Total # Releases	(9) Ultimate Avg Cost per Claim
1984	290,848	290,847.82	290,848	-	-	-	6	48,475
1985	3,079,026	3,079,026	2,996,346	82,680	3	27,560	25	123,161
1986	7,920,646	7,920,646	7,258,150	662,496	6	110,416	81	97,786
1987	10,272,431	10,272,431	9,766,705	505,726	6	84,288	96	107,004
1988	19,010,357	19,010,357	16,571,459	2,438,899	18	135,494	202	94,111
1989	29,948,866	29,948,866	27,969,724	1,979,142	16	123,696	371	80,725
1990	31,556,469	31,556,469	28,415,824	3,140,645	23	136,550	443	71,234
1991	32,141,380	32,141,380	28,716,619	3,424,761	26	131,722	480	66,961
1992	31,443,816	31,443,816	29,342,638	2,101,178	18	116,732	413	76,135
1993	34,466,129	34,466,129	31,905,885	2,560,244	21	121,916	536	64,302
1994	26,620,704	26,620,704	24,607,411	2,013,294	16	125,831	477	55,809
1995	32,810,823	32,810,823	30,488,609	2,322,214	18	129,012	571	57,462
1996	28,413,859	28,413,859	24,754,744	3,659,114	32	114,347	504	56,377
1997	12,877,853	12,877,853	10,762,357	2,115,496	16	132,219	303	42,501
1998	18,394,285	18,394,285	15,295,498	3,098,787	31	99,961	340	54,101
1999	14,596,296	14,596,296	12,430,242	2,166,054	23	94,176	253	57,693
2000	8,665,516	8,665,516	6,494,990	2,170,527	16	135,658	130	66,658
2001	4,511,866	4,511,866	4,110,657	401,210	9	44,579	81	55,702
2002	3,374,260	3,374,260	2,648,456	725,804	8	90,726	76	44,398
2003	3,396,197	3,396,197	2,901,472	494,725	7	70,675	94	36,130
2004	11,398,020	11,398,020	8,926,518	2,471,502	14	176,536	140	81,414
2005	6,645,526	6,645,526	5,010,383	1,635,143	10	163,514	77	86,306
2006	5,599,346	5,599,346	3,540,948	2,058,397	14	147,028	60	93,322
2007	784,891	784,891	-	784,891	7	112,127	30	26,163
2008	416,342	416,342	-	416,342	5	83,268	17	24,491
2009	586,261	586,261	-	586,261	5	117,252	26	22,549
2010	920,283	920,283	-	920,283	12	76,690	32	28,759
2011	1,386,803	1,386,803	-	1,386,803	18	77,045	41	33,824
2012	1,097,210	1,097,210	-	1,097,210	26	42,200	60	18,287
2013	996,464	996,464	-	996,464	23	43,325	35	28,470
2014	398,700	398,700	-	398,700	22	18,123	23	17,335
Total	**384,021,473**	**384,021,473**	**335,206,480**	**48,814,993**	**469**	**104,083**	**6,023**	**63,759**
Pre-6/30/06 Total	**376,946,930**	**376,946,930**	**335,206,480**	**41,740,450**	**347**	**120,289**	**5,748**	**65,579**
Post-6/30/06 Total	**7,074,543**	**7,074,543**	**-**	**7,074,543**	**122**	**57,988**	**277**	**25,540**

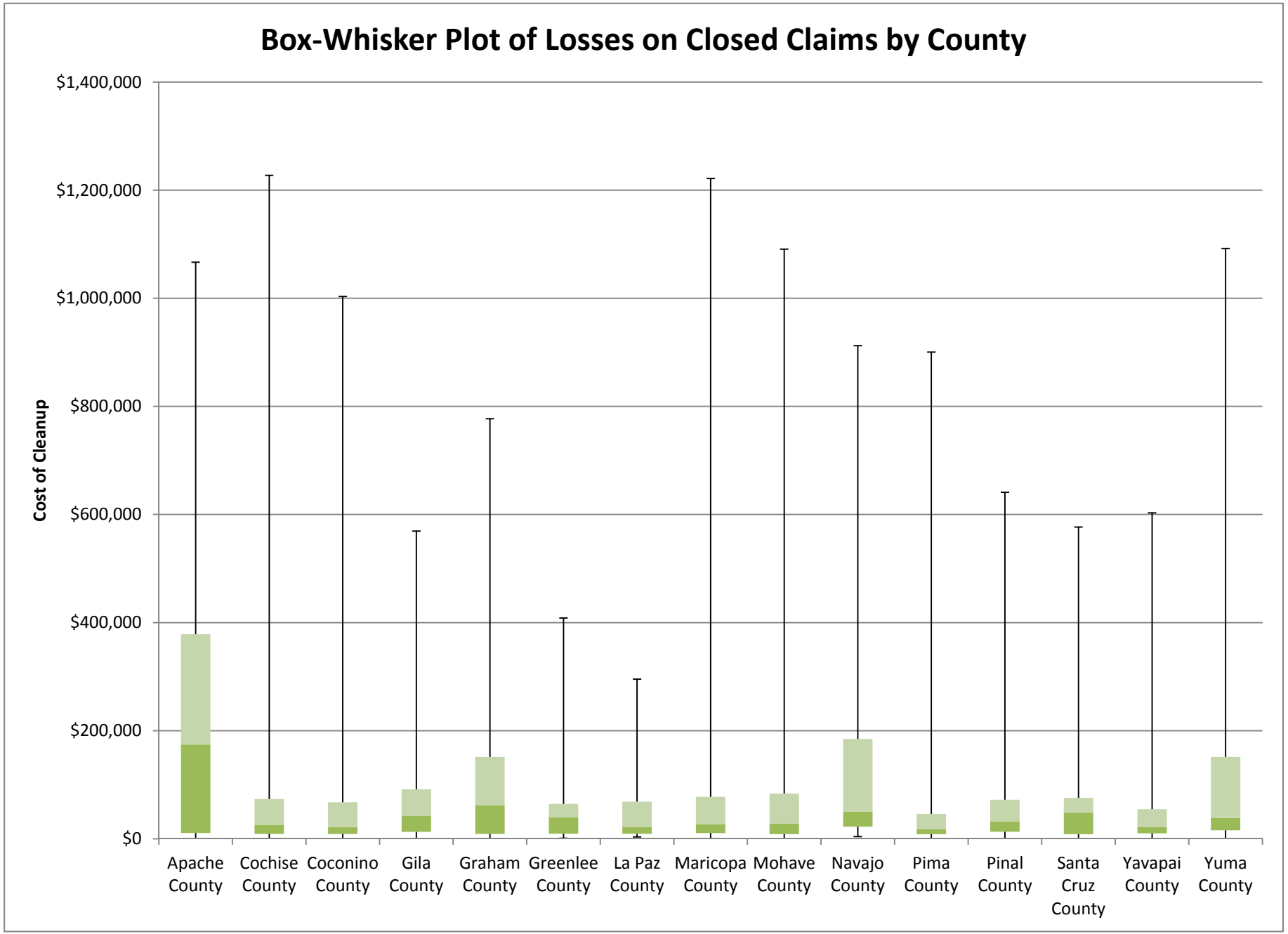
Notes: Column (5) = (3) - (4)
Column (7) = (5) / (6)
Column (9) = (3) / (8)
Columns (6) and (9) define a release as the set of releases reported at a single facility on a single date

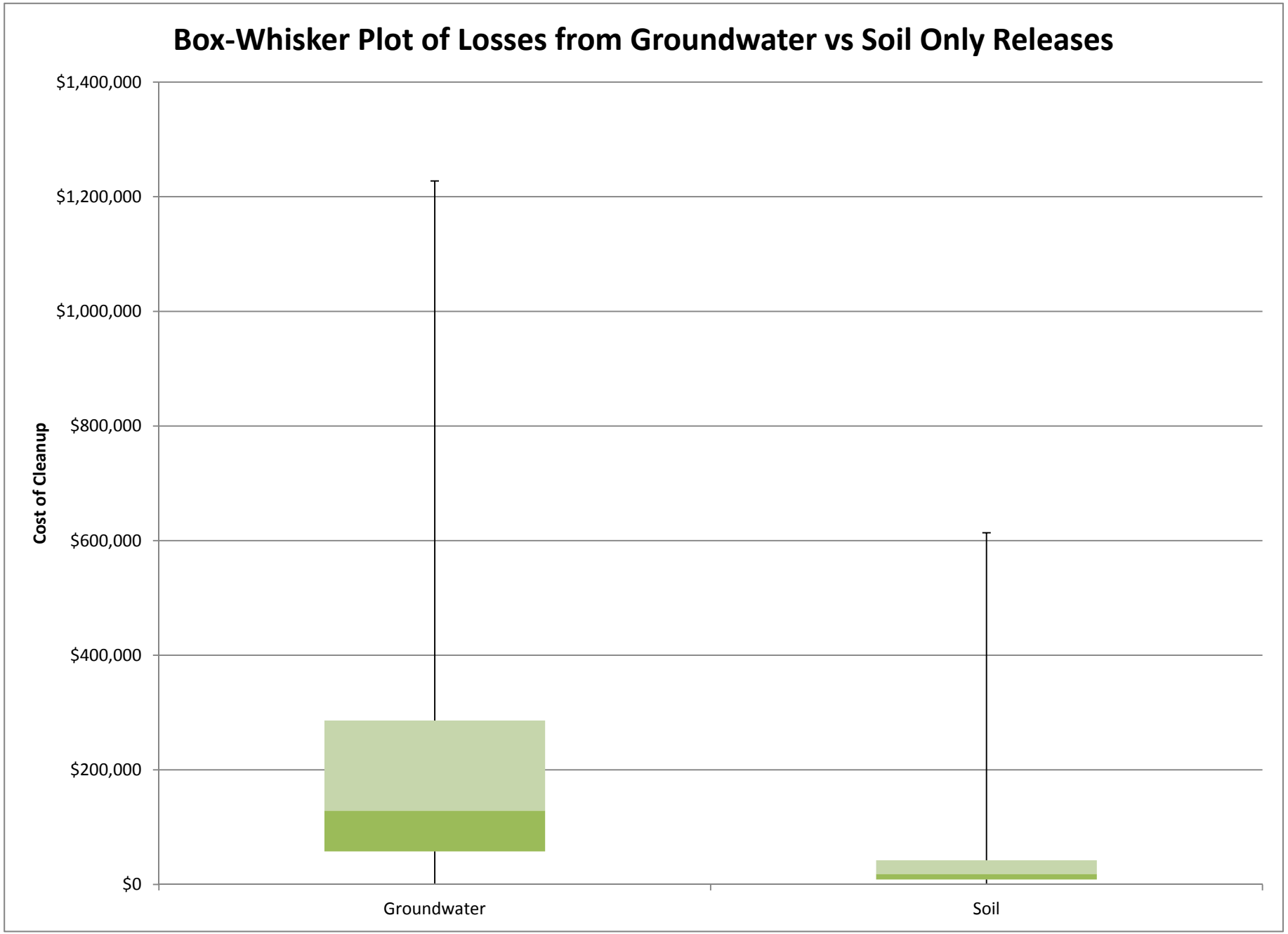
Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Summary of Reserves for Reported Claims
Average Cost of Closure to Non-Tier 1 Standard

(1) Report Year	(2) Ultimate Loss Excl. State Lead	(3) Total Ultimate Loss	(4) Paid Loss	(5) Unpaid Loss	(6) # Open Releases	(7) Average Reserve Per Open Claim	(8) Total # Releases	(9) Ultimate Avg Cost per Claim
1984	290,848	290,848	290,848	-	-	-	6	48,475
1985	3,079,930	3,079,930	2,996,346	83,584	3	27,861	25	123,197
1986	7,924,260	7,924,260	7,258,150	666,110	6	111,018	81	97,830
1987	10,275,142	10,275,142	9,766,705	508,437	6	84,739	96	107,033
1988	19,018,489	19,018,489	16,571,459	2,447,030	18	135,946	202	94,151
1989	29,959,708	29,959,708	27,969,724	1,989,985	16	124,374	371	80,754
1990	31,570,925	31,570,925	28,415,824	3,155,102	23	137,178	443	71,266
1991	32,158,547	32,158,547	28,716,619	3,441,928	26	132,382	480	66,997
1992	31,455,562	31,455,562	29,342,638	2,112,924	18	117,385	413	76,164
1993	34,479,683	34,479,683	31,905,885	2,573,798	21	122,562	536	64,328
1994	26,630,644	26,630,644	24,607,411	2,023,233	16	126,452	477	55,829
1995	32,822,569	32,822,569	30,488,609	2,333,960	18	129,664	571	57,483
1996	28,434,511	28,434,511	24,754,744	3,679,767	32	114,993	504	56,418
1997	12,888,696	12,888,696	10,762,357	2,126,339	16	132,896	303	42,537
1998	18,415,970	18,415,970	15,295,498	3,120,472	31	100,660	340	54,165
1999	14,614,367	14,614,367	12,430,242	2,184,125	23	94,962	253	57,764
2000	8,679,070	8,679,070	6,494,990	2,184,080	16	136,505	130	66,762
2001	4,516,384	4,516,384	4,110,657	405,727	9	45,081	81	55,758
2002	3,380,585	3,380,585	2,648,456	732,129	8	91,516	76	44,481
2003	3,401,618	3,401,618	2,901,472	500,146	7	71,449	94	36,187
2004	11,410,670	11,410,670	8,926,518	2,484,152	14	177,439	140	81,505
2005	6,654,562	6,654,562	5,010,383	1,644,179	10	164,418	77	86,423
2006	5,617,369	5,617,369	3,540,948	2,076,421	14	148,316	60	93,623
2007	800,620	800,620	-	800,620	7	114,374	30	26,687
2008	427,577	427,577	-	427,577	5	85,515	17	25,152
2009	597,497	597,497	-	597,497	5	119,499	26	22,981
2010	947,247	947,247	-	947,247	12	78,937	32	29,601
2011	1,427,250	1,427,250	-	1,427,250	18	79,292	41	34,811
2012	1,155,633	1,155,633	-	1,155,633	26	44,447	60	19,261
2013	1,048,145	1,048,145	-	1,048,145	23	45,572	35	29,947
2014	443,396	443,396	-	443,396	22	20,154	23	19,278
Total	**384,527,474**	**384,527,474**	**335,206,480**	**49,320,994**	**469**	**105,162**	**6,023**	**63,843**
Pre-06 Total	**377,183,532**	**377,183,532**	**335,206,480**	**41,977,052**	**347**	**120,971**	**5,748**	**65,620**
Post-06 Total	**7,343,942**	**7,343,942**	**-**	**7,343,942**	**122**	**60,196**	**277**	**26,512**

Notes: Column (5) = (3) - (4)
Column (7) = (5) / (6)
Column (9) = (3) / (8)
Columns (6) and (9) define a release as the set of releases reported at a single facility on a single date

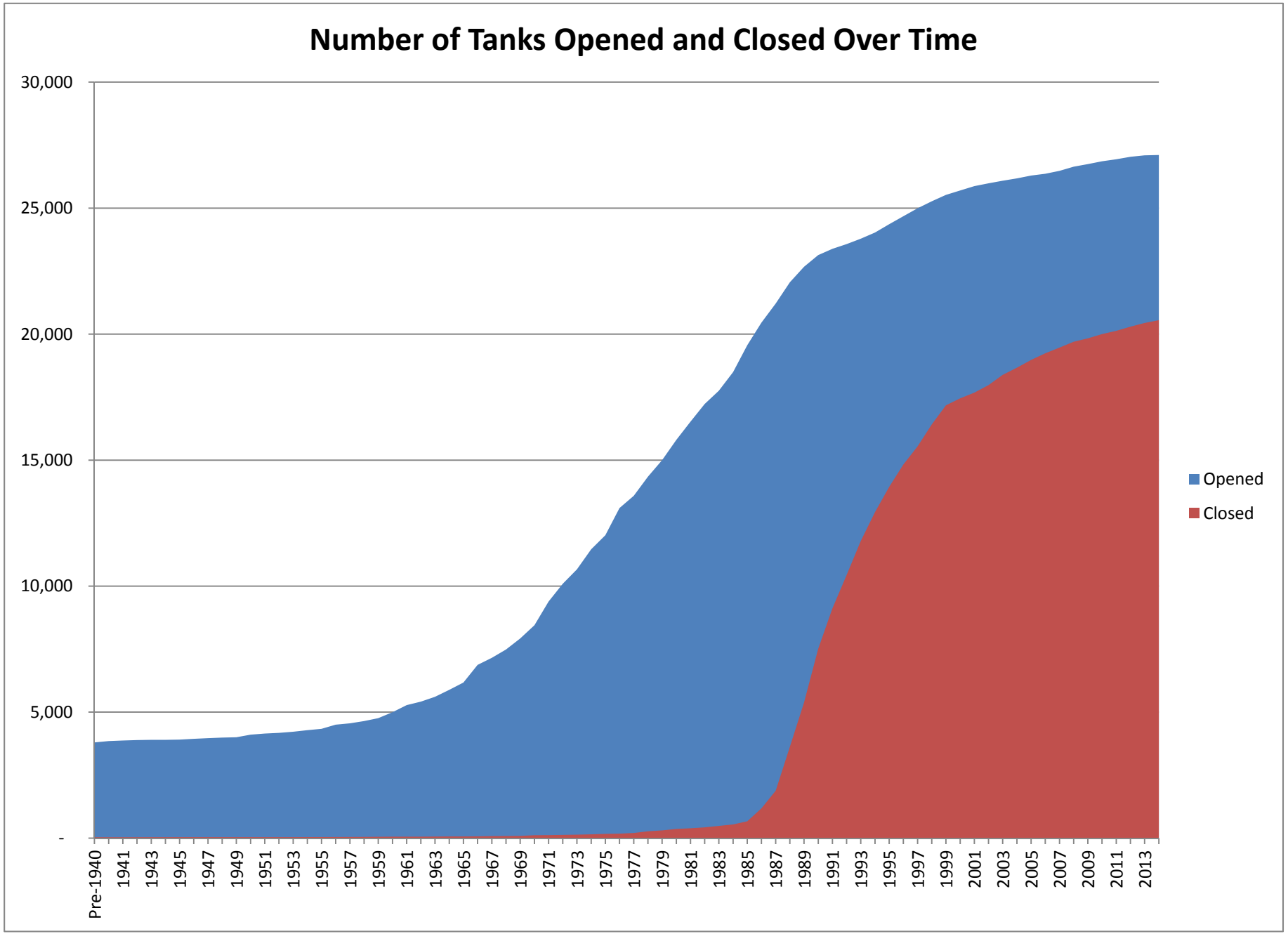

Box-Whisker Plot of Cost by Cleanup Standard
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$0
Cost of Cleanup
Tier 1
Tier 2
Tier 3

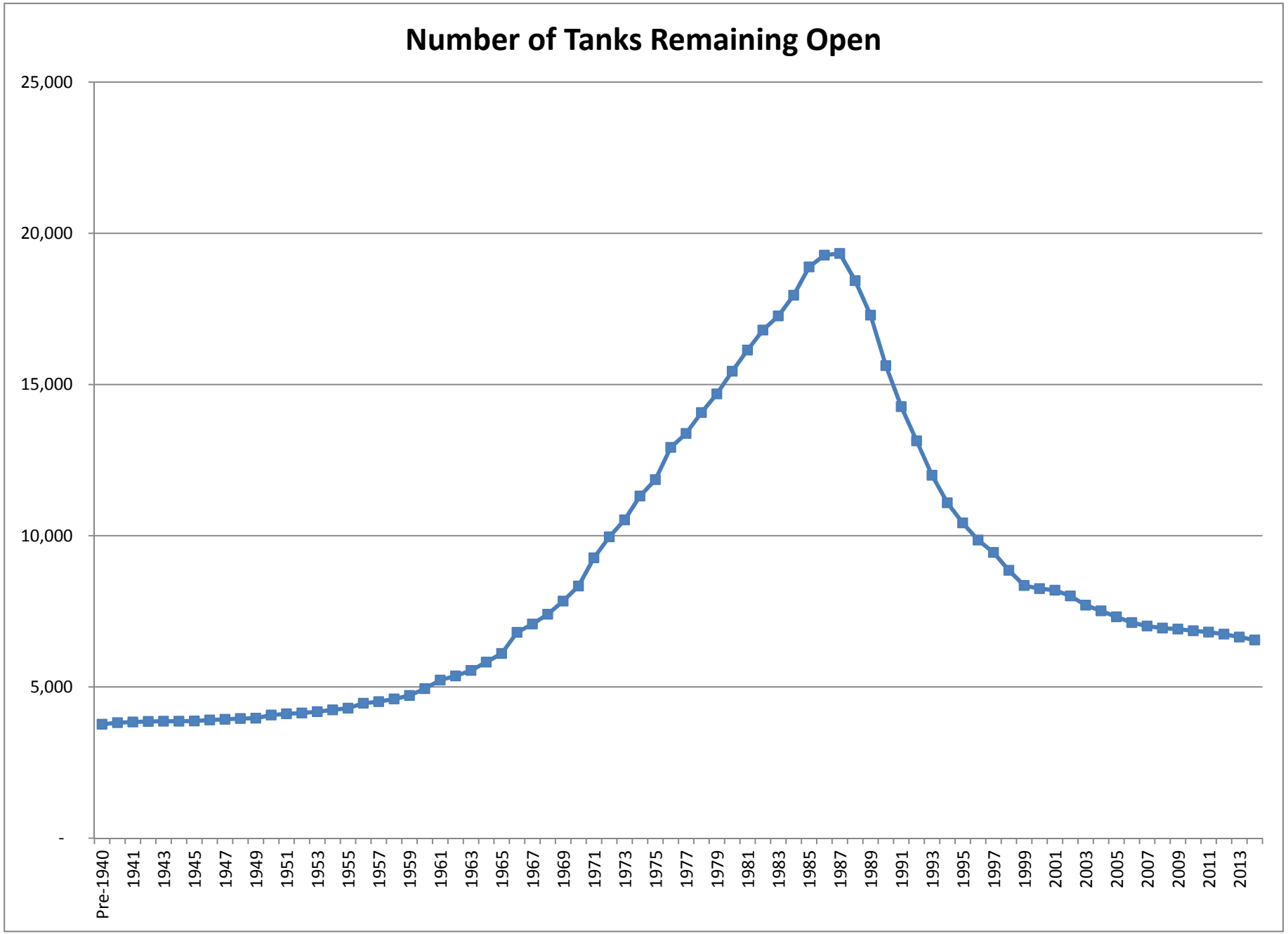

Box-Whisker Plot of Losses on Closed Claims by County
Cost of Cleanup
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$0
Apache County
Cochise County
Coconino County
Gila County
Graham County
Greenlee County
La Paz County
Maricopa County
Mohave County
Navajo County
Pima County
Pinal County
Santa Cruz County
Yavapai County
Yuma County


Box-Whisker Plot of Losses from Groundwater vs Soil Only Releases
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$0
Cost of Cleanup
Groundwater
Soil

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Cost of Baseline Assessments

(1)	Number of Sites with Non-Permanently Closed Tanks		2,343
(2)	Cost Per Foot for Vertical Borings	$	13.17
(3)	Cost Per Foot for Angle Borings = (2) + 3.50	$	16.67
(4)	Distance in Feet for 10 Vertical Borings = 30 x 10		300
(5)	Distance in Feet for 4 Vertical Borings = 30 x 4		120
(6)	Distance in Feet for 2 Angle Borings = 82 x 2		164
(7)	Cost for 10 Vertical Borings	$	3,951
(8)	Cost for 2 Angle Borings and 4 Vertical Borings	$	4,314
(9)	Cost for 4 Vertical Borings	$	1,580
(10)	Additional Expenses for Soil Borings	$	12,293
(11)	Total Cost for 10 Vertical Borings Per Site	$	38,059,692
(12)	Total Cost for 2 Angle Borings and 4 Vertical Borings Per Site	$	38,910,857
(13)	Total Cost for 4 Vertical Borings Per Site	$	32,505,376


Number of Tanks Opened and Closed Over Time
30,000
25,000
20,000
15,000
10,000
5,000
-
Pre-1940
1941
1943
1945
1947
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
Opened
Closed


Number of Tanks Remaining Open
25,000
20,000
15,000
10,000
5,000
-
Pre-1940
1941
1943
1945
1947
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Cost of Tank Removal

(1)	(2)	(3)	(4)	(5)
Year	Expected No. Tanks Removed	Avg Size of Removed Tanks	Expected Cost Per Removal	Est. Total Cost of Removals
2015	150	10,040	19,650	$1,375,580
2016	147	10,333	20,043	$1,370,397
2017	150	10,714	20,444	$1,432,843
2018	147	11,096	20,853	$1,429,865
2019	146	11,571	21,270	$1,452,479
2020-2024	784	12,415	22,349	$8,164,300
2025-2029	835	13,243	24,676	$9,607,499
2030-2035	892	13,311	27,244	$11,323,674
Total	3,251	12,493		$36,156,637

Note: Column (4) assumes an average of 2.15 tanks removed per removal operation. Cost is trended at 2% per annum.
Column (5) = (2) x (4) / 2.15 tanks per removal

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Leaks Identified from Baseline Assessments and Tank Removal

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Report Year	Reported Releases	Releases At Closure	Non-Closure Releases	Tank Closures	% Releases at Closure = (3) / (5)	Remaining Open Tanks	Non-Clos. Releases per 1000 Open Tanks = (4) / (7)	Percent of Claims with Groundwater Impact
1984	6	-	6	57	0.0%	17,950	0.00	78%
1985	25	-	25	126	0.0%	18,889	1.32	33%
1986	81	11	70	512	2.1%	19,277	3.63	22%
1987	96	17	79	699	2.4%	19,334	4.09	30%
1988	202	52	150	1,741	3.0%	18,434	8.14	26%
1989	371	52	319	1,756	3.0%	17,293	18.45	24%
1990	443	75	368	2,132	3.5%	15,625	23.55	21%
1991	480	88	392	1,607	5.5%	14,268	27.47	19%
1992	413	121	292	1,320	9.2%	13,135	22.23	22%
1993	536	184	352	1,352	13.6%	12,000	29.33	17%
1994	477	147	330	1,153	12.7%	11,090	29.76	16%
1995	571	146	425	995	14.7%	10,425	40.77	15%
1996	504	116	388	890	13.0%	9,854	39.37	15%
1997	303	77	226	720	10.7%	9,447	23.92	17%
1998	340	80	260	869	9.2%	8,857	29.36	17%
1999	253	68	185	759	9.0%	8,352	22.15	23%
2000	130	21	109	277	7.6%	8,249	13.21	21%
2001	81	14	67	226	6.2%	8,196	8.17	20%
2002	76	-	76	299	0.0%	8,008	9.49	16%
2003	94	8	86	408	2.0%	7,703	11.16	11%
2004	140	-	140	283	0.0%	7,514	18.63	28%
2005	77	9	68	311	2.9%	7,316	9.29	32%
2006	60	4	56	259	1.5%	7,128	7.86	26%
2007	30	-	30	231	0.0%	7,013	4.28	26%
2008	17	-	17	231	0.0%	6,946	2.45	29%
2009	26	-	26	134	0.0%	6,913	3.76	23%
2010	32	-	32	167	0.0%	6,857	4.67	21%
2011	41	4	37	129	3.1%	6,812	5.43	37%
2012	60	-	60	166	0.0%	6,744	8.90	13%
2013	35	-	35	150	0.0%	6,649	5.26	17%
2014	23	2	21	110	1.8%	6,552	3.21	4%
Total	6,023	1,296	4,727	20,069	6.5%		14.20	20%
Total Active or Closed Tanks ('84-present)				5-Year Average	1.0%		5.49	19%
26,621				10-Year Average	0.9%		5.51	23%
Total Releases per Tank (= 6,023 / 26,612)				15-Year Average	1.7%		7.72	22%
22.6%				All-Year Average	4.4%		14.17	23%
Selected					4.4%		11.12	23%

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Leaks Identified from Baseline Assessments and Tank Removal

(1) Report Year	(2) Projected Tank Closures	(3) Projected Releases from Closures	(4) Projected Tanks Open Tanks	(5) Projected Releases from Baseline	(6) Projected Releases from Other	(7) Total Projected Releases
2015	150	6.6	6,475	366.3	72.0	444.9
2016	147	6.5	6,400	362.0	53.4	421.9
2017	150	6.6	6,327	357.9	35.2	399.7
2018	147	6.5	6,261	354.1	17.4	378.0
2019	146	6.5	6,196	-	17.2	23.7
2020-2024	784	34.6	5,965	-	82.9	117.5
2025-2029	835	36.8	5,552	-	77.2	114.0
2030-2035	892	39.3	5,120	-	71.2	110.5
Total	3,251	143.4		1,440.3	426.4	2,010.0

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Cost of Cleanup for Releases Identified from Tank Closures

(1)	(2)	(3)	(4)	(5)
Report Year	Projected Releases from Closures	Projected Cost of Cleanups Tier 1	Tier 2	Tier 3
2015	6.6	335,045	331,060	330,204
2016	6.5	327,238	323,346	322,510
2017	6.6	335,441	331,451	330,594
2018	6.5	328,180	324,276	323,438
2019	6.5	326,834	322,946	322,111
2020-2024	34.6	1,748,378	1,727,582	1,723,117
2025-2029	36.8	1,863,485	1,841,319	1,836,561
2030-2035	39.3	1,989,308	1,965,646	1,960,566
Total	143.4	7,253,908	7,167,625	7,149,102

Note: Cost of cleanup based on average cost of cleanup to the noted standard for groundwater and soil-only impacts and the expected percent of groundwater impacts

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Cost of Cleanup for Releases Identified By Baseline Assessments

(1)	(2)	(3)	(4)	(5)
	Projected			
Report	Releases from	Projected Cost of Cleanups		
Year	Baseline Assessments	Tier 1	Tier 2	Tier 3
2015	366.3	18,528,939	18,308,544	18,261,228
2016	362.0	18,315,078	18,097,227	18,050,458
2017	357.9	18,105,634	17,890,275	17,844,040
2018	354.1	17,915,995	17,702,891	17,657,141
2019	-	-	-	-
2020-2024	-	-	-	-
2025-2029	-	-	-	-
2030-2035	-	-	-	-
Total	1,440.3	72,865,645	71,998,937	71,812,867

Note: Cost of cleanup based on average cost of cleanup to the noted standard for groundwater and soil-only impacts and the expected percent of groundwater impacts

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Cost of Cleanup for Releases Identified By Other Means

(1)	(2)	(3)	(4)	(5)
Report Year	Projected Releases Identified By Other Means	Projected Cost of Cleanups Tier 1	Tier 2	Tier 3
2015	72.0	3,642,090	3,598,769	3,589,469
2016	53.4	2,700,040	2,667,924	2,661,029
2017	35.2	1,779,442	1,758,277	1,753,733
2018	17.4	880,402	869,930	867,682
2019	17.2	871,195	860,832	858,608
2020-2024	82.9	4,193,660	4,143,778	4,133,069
2025-2029	77.2	3,903,353	3,856,924	3,846,957
2030-2035	71.2	3,599,599	3,556,783	3,547,592
Total	426.4	21,569,782	21,313,218	21,258,137

Note: Cost of cleanup based on average cost of cleanup to the noted standard for groundwater and soil-only impacts and the expected percent of groundwater impacts

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Cost of Cleanup for All Releases

(1)	(2)	(3)	(4)	(5)
Report Year	Projected Total Releases	Projected Cost of Cleanups Tier 1	Tier 2	Tier 3
2015	444.9	22,506,074	22,238,373	22,180,901
2016	421.9	21,342,355	21,088,497	21,033,997
2017	399.7	20,220,517	19,980,002	19,928,367
2018	378.0	19,124,577	18,897,097	18,848,261
2019	23.7	1,198,028	1,183,778	1,180,719
2020-2024	117.5	5,942,038	5,871,360	5,856,186
2025-2029	114.0	5,766,838	5,698,244	5,683,518
2030-2035	110.5	5,588,907	5,522,429	5,508,157
Total	2,010.0	101,689,335	100,479,780	100,220,106

Note: Cost of cleanup based on average cost of cleanup to the noted standard for groundwater and soil-only impacts and the expected percent of groundwater impacts

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Cash Flows by Year

(1) Fiscal Year	(2) Cost of Cleanup	(3) Baseline Assessments	(4) Tank Removals	(5) Total Cash Flow
2015	20,433,780	9,122,994	1,375,580	30,932,354
2016	9,264,374	9,122,994	1,370,397	19,757,764
2017	8,442,394	9,122,994	1,432,843	18,998,231
2018	8,900,342	9,122,994	1,429,865	19,453,201
2019	9,507,868	-	1,452,479	10,960,347
2020-2024	40,133,855	-	8,164,300	48,298,155
2025-2029	26,471,297	-	9,607,499	36,078,796
2030-2034	16,279,578	-	11,323,674	27,603,252
Total	139,433,488	36,491,975	36,156,637	212,082,100

Notes: Column (3) equal to average cost of assessment methods analyzed,
Spread over four years.

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Annual Revenue and Expenditures - UST Fund Only

(1) Fiscal Year	(2) Fuel Tax Revenue	(3) Transfers	(4) Net Revenues	(5) Corrective Action Costs	(6) Other Expenses	(7) Total Disbursements	(8) Total Cashflow	(9) Beginning Balance	(10) Ending Balance
2013	$29,406,000	$50,498,000	($21,092,000)	$270,000	$5,783,000	$6,053,000	($27,145,000)	$27,167,000	$22,000
2014	$28,800,000	$21,843,700	$6,956,300	$200	$6,599,100	$6,599,300	$357,000	$22,000	$379,000
2015	$28,800,000	$14,370,500	$14,429,500	$20,433,780	$17,029,574	$37,463,354	($23,033,854)	$379,000	($22,654,854)
2016	$28,800,000	$0	$28,800,000	$9,264,374	$17,024,390	$26,288,764	$2,511,236	($22,654,854)	($20,143,618)
2017	$28,800,000	$0	$28,800,000	$8,442,394	$17,217,457	$25,659,851	$3,140,149	($20,143,618)	($17,003,469)
2018	$28,800,000	$0	$28,800,000	$8,900,342	$17,347,711	$26,248,053	$2,551,947	($17,003,469)	($14,451,522)
2019	$28,800,000	$0	$28,800,000	$9,507,868	$8,383,229	$17,891,096	$10,908,904	($14,451,522)	($3,542,619)
2020-2024	$139,680,000	$0	$139,680,000	$40,133,855	$44,576,812	$84,710,666	$54,969,334	($3,542,619)	$51,426,715
2025-2029	$132,480,000	$0	$132,480,000	$26,471,297	$49,809,854	$76,281,151	$56,198,849	$51,426,715	$107,625,564
2030-2034	$125,280,000	$0	$125,280,000	$16,279,578	$55,710,322	$71,989,900	$53,290,100	$107,625,564	$160,915,664

Note: Actual 2013-14 Experience and 2015-16 Estimates provided by ADEQ.

Column (2) assumes $2.4 million in revenues per month. For 2020-2034, anticipated revenues are trended downward linearly at 1% per year To reflect anticipated reductions in fuel usage.

Column (3) provided by ADEQ, and assumes transfers out through January 1, 2015.

Column (4) = (2) - (3)

Column (5) includes projected cost of cleanup for each year.

Column (6) includes projected cost of baseline assessments, tank removals, and "staffing and other expenses," including: personal services and related benefits, professional and outside services, travel, other operating and equipment expenses. Staffing and other expenses are equal to $6,531,000 and are trended at 2% per year after 2016 for inflation.

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Retrospective Cost Savings from Application of Deductible

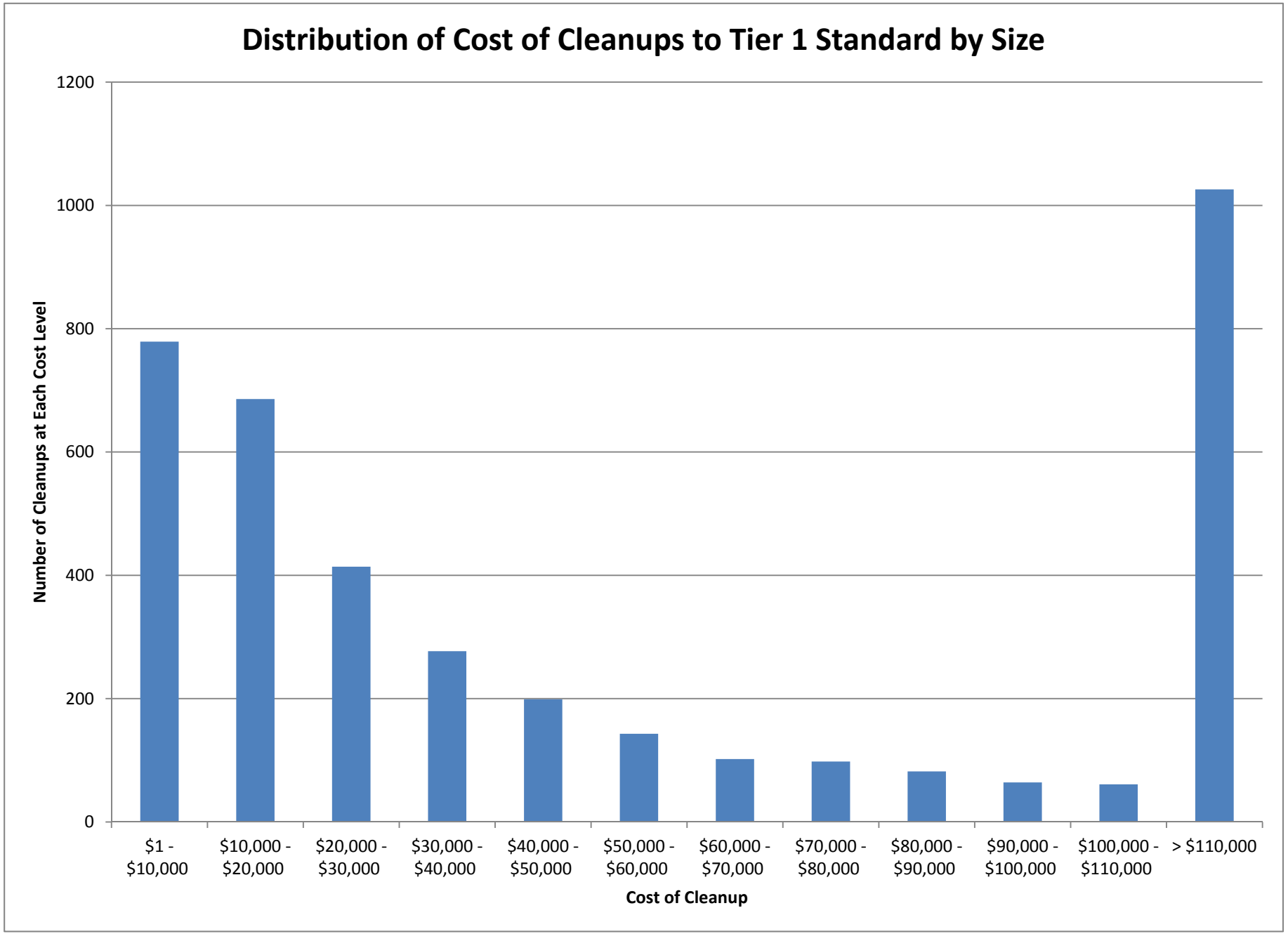
	Corrective Action Cost at Deductible for 2015-2034			Approximate % Savings		
Deductible	Tier 1	Tier 2	Tier 3	Tier 1	Tier 2	Tier 3
No Deductible	389,674,721	385,033,474	384,021,473	0.0%	0.0%	0.0%
2,500	380,014,719	375,375,973	374,367,990	2.5%	2.5%	2.5%
5,000	370,737,409	366,102,157	365,099,543	4.9%	4.9%	4.9%
7,500	361,985,922	357,357,411	356,358,861	7.1%	7.2%	7.2%
10,000	353,791,585	349,169,943	348,175,499	9.2%	9.3%	9.3%
12,500	346,176,214	341,563,637	340,572,598	11.2%	11.3%	11.3%
15,000	339,030,005	334,425,350	333,441,327	13.0%	13.1%	13.2%
17,500	332,285,123	327,687,063	326,741,304	14.7%	14.9%	14.9%
20,000	325,926,039	321,343,558	320,450,439	16.4%	16.5%	16.6%

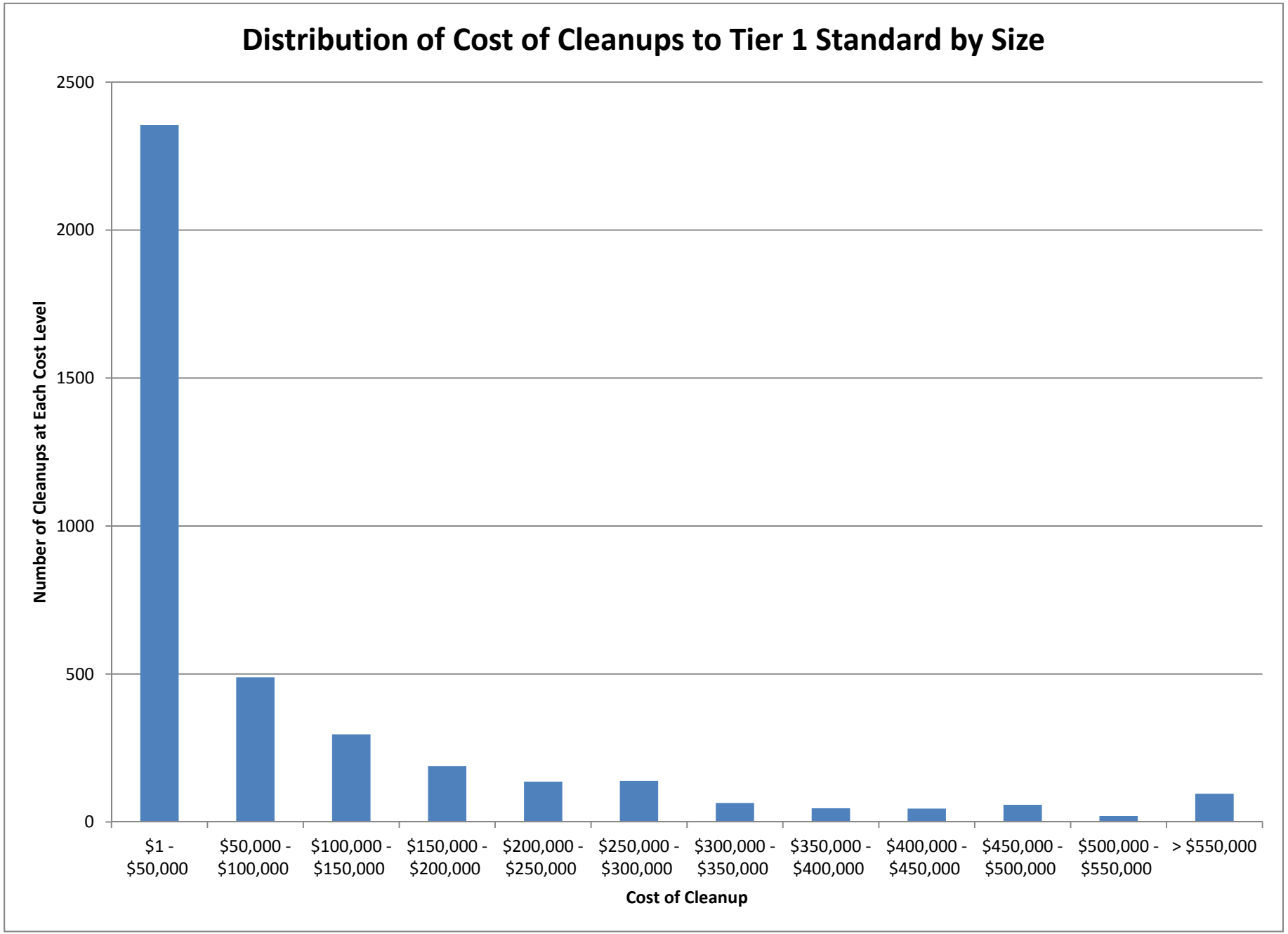
Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Cost Savings from Application of Deductible

	Costs Defrayed By Deductible in 2015-2034							
	Tank	Baseline	Corrective Action Costs			Total Savings		
Deductible	Removal	Assessments	Tier 1	Tier 2	Tier 3	Tier 1	Tier 2	Tier 3
2,500	3,789,035	5,857,500	2,520,870	2,520,258	2,519,320	12,167,404	12,166,792	12,165,855
5,000	7,578,069	11,715,000	4,941,872	4,940,388	4,938,156	24,234,941	24,233,457	24,231,225
7,500	11,367,104	17,572,500	7,225,656	7,222,449	7,219,258	36,165,260	36,162,053	36,158,861
10,000	15,156,138	23,430,000	9,364,047	9,359,082	9,354,913	47,950,185	47,945,220	47,941,051
12,500	18,945,173	29,287,500	11,351,350	11,344,052	11,339,082	59,584,023	59,576,725	59,571,755
15,000	22,734,207	35,145,000	13,216,222	13,206,886	13,200,167	71,095,429	71,086,094	71,079,375
17,500	26,523,242	36,491,975	14,976,363	14,965,335	14,948,707	77,991,580	77,980,552	77,963,925
20,000	30,312,277	36,491,975	16,635,826	16,620,760	16,590,467	83,440,078	83,425,011	83,394,719

Arizona Department of Environmental Quality
UST Program Actuarial Study as of June 30, 2014
Percent Cost Savings from Application of Deductible

	Costs Defrayed By Deductible in 2015-2033							
	Tank	Baseline	Corrective Action Costs			Total Savings		
Deductible	Removal	Assessments	Tier 1	Tier 2	Tier 3	Tier 1	Tier 2	Tier 3
2,500	10%	16%	5%	5%	5%	10%	10%	10%
5,000	21%	32%	9%	10%	10%	19%	20%	20%
7,500	31%	48%	13%	14%	15%	28%	30%	30%
10,000	42%	64%	17%	19%	19%	38%	39%	39%
12,500	52%	80%	21%	23%	23%	47%	49%	49%
15,000	63%	96%	24%	27%	27%	56%	58%	59%
17,500	73%	100%	27%	30%	31%	61%	64%	64%
20,000	84%	100%	31%	33%	34%	66%	68%	69%


Distribution of Cost of Cleanups to Tier 1 Standard by Size
Number of Cleanups at Each Cost Level
1200
1000
800
600
400
200
0
$1 - $10,000
$10,000 - $20,000
$20,000 - $30,000
$30,000 - $40,000
$40,000 - $50,000
$50,000 - $60,000
$60,000 - $70,000
$70,000 - $80,000
$80,000 - $90,000
$90,000 - $100,000
$100,000 - $110,000
> $110,000
Cost of Cleanup


Distribution of Cost of Cleanups to Tier 1 Standard by Size
Number of Cleanups at Each Cost Level
2500
2000
1500
1000
500
0
$1 - $50,000
$50,000 - $100,000
$100,000 - $150,000
$150,000 - $200,000
$200,000 - $250,000
$250,000 - $300,000
$300,000 - $350,000
$350,000 - $400,000
$400,000 - $450,000
$450,000 - $500,000
$500,000 - $550,000
> $550,000
Cost of Cleanup