Economic Analysis of the Bulk Pesticides Containment Structures Final Regulation

June 1, 2006

Executive Summary

The Environmental Protection Agency (EPA) is finalizing the standards for bulk pesticide containment structures as required under Section 19 of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). The final standards include design requirements for new and existing secondary containment structures and pads at bulk agricultural pesticide storage facilities. Improvements in the containment of bulk pesticides at these facilities will help to protect humans and the environment from leaks and spills from bulk pesticide storage, and to protect soil and water from contamination due to pesticide dispensing operations.

The total annual cost of compliance with the final standards for bulk pesticide containment structures to the regulated industries (i.e., agricultural pesticide refillers and agricultural commercial applicators) is estimated to be $2.93 million. This estimate is based on an examination of the current level of compliance for bulk agricultural pesticide containment facilities with the final standards, and the cost of moving from the current level of compliance to the final standards. The annual cost to agricultural pesticide refillers is estimated to be $2.71 million, while agricultural commercial applicators are estimated to incur costs of $0.23 million per year. The analysis of the estimated small business impacts of the final standards for bulk pesticide containment structures suggests that there will not be a significant number of small bulk pesticide storage facilities impacted by the final standards.

The final bulk pesticide containment standards are expected to result in benefits to both humans and the environment due to a reduction in the number of accidental spills and leaks of pesticides at bulk pesticide storage facilities. The benefits from avoiding the costs of remediation of such spills are estimated to be between $12.2 million and $18.6 million annually. Due to a lack of data on human and environmental effects from exposure to pesticides from bulk pesticide containment related spills, the quantified benefits of the final standards do not include the value of reducing risk to humans and the environment. However, a number of published studies document contamination at bulk agricultural pesticide storage facilities, and it is expected that the benefits to humans and the environment of reducing the number of accidental pesticide releases from these facilities could be significant.

The bulk pesticide containment regulations were proposed in 1994. In response to public comments a number of changes were made to the proposed bulk pesticide containment standards, and these changes are reflected in the final rule. Due to these changed standards, the total estimated cost of compliance fell by more than two-thirds, from $12.96 million for the proposed rule to $2.93 million for the final rule. Among the more significant changes in the standards that led to a lower estimated cost for the final rule are the elimination of requirements to retrofit existing structures during the interim period, the elimination of a hydraulic conductivity standard, and a reduction in capacity requirements.

The estimated benefits of compliance with the bulk pesticide containment structures regulations increased 60% from the proposed to the final rule. The increase is due to the different assumptions made in each analysis regarding the probability of an accidental release from a bulk pesticide storage facility (i.e., 1.5% for the proposed regulations versus 1.0% for the final regulations), and the number of bulk storage facilities that could have an accidental release (i.e., 3,000 bulk pesticide storage facilities for the proposed regulations versus 5,811 bulk pesticide storage facilities for the final regulations). The analysis of the proposed regulations did not quantify the benefits of reduced risk to humans and the environment. As is the case with the current analysis of the final containment standards, the lack of available data on the human and environmental effects of pesticide exposure from the bulk pesticide storage facilities made such an analysis infeasible.

Table of Contents

1.0 Introduction 1
1.1 The Need for Regulation 2
1.2 Pesticide Container Design and Residue Removal and Containment Structures: Regulatory Background of the Final Rule 4
1.3 Scope of the Economic Analysis for the Final Pesticide Containment Regulations 5
1.4 Estimated Costs and Benefits of Compliance with the Final Pesticide Containment Regulations 6
2.0 Final Bulk Pesticide Containment Regulations and Changes in the Regulations from the Proposed to Final Rule 8
2.1 Final Bulk Pesticide Containment Regulations 8
2.2 Standards for New and Existing Pesticide Containment Structures 9
2.2.1 Final Critical, Performance-Based Criteria for Existing Containment Structures 9
2.2.2 Final Standards for New Pesticide Containment Structures 10
2.2.3 State Pesticide Containment Standards 11
2.3 Changes in the Final Pesticide Containment Regulations from the Proposed to the Final Rule 12
2.3.1 General Requirements 12
2.3.2 Capacity Standards 15
2.3.3 Interim Standards for Existing Structures 16
2.3.4 Scope of the Containment Regulations 16
2.4 Comparison of the Estimated Costs and Benefits of the Final and Proposed Standards 17
3.0 Baseline Compliance Profile of the Regulated Community 19
3.1 Compliance Profile of Agricultural Pesticide Refillers 24
3.1.1 Total Number of Agricultural Pesticide Refillers 24
3.1.2 Number of Agricultural Pesticide Refillers with Bulk Pesticide Storage 27
3.1.3 Agricultural Pesticide Refillers Requiring Installation of New Containment Structures 29
3.1.4 Agricultural Pesticide Refillers Requiring Retrofitting of Existing Containment Structures 31
3.2 Compliance Profile of Agricultural Commercial Applicators 34
3.2.1 Total Number of Agricultural Commercial Applicators 34
3.2.2 Number of Agricultural Commercial Applicators With Bulk Pesticide Storage 36
3.2.3 Independent Applicators Requiring Installation of New Containment Structures 36
3.2.4 Agricultural Commercial Applicators Requiring Retrofitting of Existing Containment Structures 37
3.3 Baseline Economic Profile of the Regulated Community 38
3.3.1 Economic Profile of Agricultural Pesticide Refillers 42
3.3.2 Economic Profile of Agricultural Commercial Applicators 44
4.0 Facility Impact Analysis 46

4.1 Compliance Costs for New Containment Structures 48
4.1.1 Representative Facility Costs (Non-Discounted) for Agricultural Refillers..... 53
4.1.2 Representative Facility Annualized Costs to Agricultural Refillers..... 56
4.1.3 Representative Facility Costs (Non-Discounted) for Commercial Applicators 64
4.1.4 Representative Facility Aggregate Annualized Costs to Commercial Applicators 64
4.1.5 Total Aggregate Annualized Costs 66
4.2 Compliance Costs for Existing Containment Structures..... 69
4.2.1 Representative Facility Costs (Non-Discounted) for Agricultural Refillers..... 71
4.2.2 Representative Facility and Aggregate Annualized Costs to Agricultural Refillers 74
4.2.3 Representative Facility Costs (Non-Discounted) for Commercial Applicators 76
4.2.4 Representative Facility and Aggregate Annualized Costs to Commercial Applicators 78
4.2.5 Uncertainty of Cost Estimates 81
4.2.6 Total Aggregate Annualized Costs 82
5.0 Industry and State Impact Analysis 83
5.1 Aggregate Compliance Costs of Regulations 83
5.1.1 Aggregate Annualized Costs under the Final Regulations 83
5.1.2 Comparison of Aggregate Annualized Costs: Proposed Versus Final Regulations..... 87
5.2 Economic Impacts of the Final Pesticide Containment Regulations 93
5.2.1 Facility-Level Impacts for Agricultural Refiller Facilities 94
5.2.2 Facility-Level Impacts for Commercial Applicator Businesses 95
5.3 State Level Costs..... 97
6.0 Benefits of Bulk Pesticide Storage Containment..... 98
6.1 Types and Evidence of Spills and Leakage..... 100
6.1.1 Evidence of the Occurrence of Spills..... 100
6.1.2 Evidence of On-Site and Off-Site Contamination 102
6.2 Valuation of the Benefits of the Pesticide Containment Rule..... 108
6.2.1 Theoretical Approach..... 108
6.2.2 An Outline of the Estimation of the Total Benefits of a Pesticide Containment Rule 111
6.3 Estimation of the Partial Benefits from Avoided Costs of Remediation 111
6.3.1 Avoided Costs of Remediation to Agricultural Pesticide Refillers and Agricultural Commercial Applicators..... 112
6.3.2 Uncertainties in the Estimate of Avoided Remediation Costs..... 116
6.3.3 Uncertainties in the Estimate of the Benefits of the Pesticide Containment Rule 117
6.4 The Potential Human Health Risks Associated with Exposure to Pesticides 118
6.4.1 Exposed Populations..... 118
6.4.2 Pesticides Evaluated..... 120
6.5 The Potential Ecological Damages Associated with Exposure to Pesticides 122
6.5.1 Exposed Populations..... 124
6.5.2 Pesticides Evaluated..... 124

6.6 Summary of the Benefits of the Final Bulk Pesticide Storage Containment Regulations and Comparison with Proposed Regulations 125
6.6.1 Summary of the Benefit of the Final Containment Regulations 125
6.6.2 Comparison of the Benefits of the Final and Proposed Containment Regulations 126
References 127

Appendixes

Appendix A: Methodology for Calculating Annualized Compliance Costs 136
Appendix B: Non-Discounted Facility-Level Costs of Compliance for the Bulk Pesticide Containment Standards 138
Appendix C: Comparison of Critical and State Containment Standards 149
Appendix D: Overview of Current Federal and State Regulations 155
D.1 Federal Regulations 155
D.2 State Regulations 156
D.3 Business and Market Considerations 159
Appendix E: EPA's Proposed Pesticide Containment Standards 160
E.1 General Requirements for Containment Structures 160
E.2 Secondary Containment for Stationary Liquid Bulk Containers 161
E.3 Secondary Containment for Stationary Dry Bulk Containers 161
E.4 Secondary Containment for Pesticide Dispensing Areas 161
E.5 Recordkeeping Requirements 162
E.6 Stationary Containers Included 163
Appendix F: Comparison of the Proposed and Final Containment Regulations 164
Appendix G. Estimated Number of Affected Facilities 168
Appendix H. Representative Facility Costs of Compliance with Secondary Containment Regulations 179
Appendix I. Facility Annualized Costs as a Share of Annual Revenue 196

Tables and Figures

Table 1.1. Quantified Costs and Benefits of the Final Containment Regulations (2005$) [a] 7
Table 2.1. Critical Standards for Existing Containment Structures 10
Table 2.2. Bulk Pesticide Containment Standards in Addition to the Critical Standards for New Containment Structures 11
Table 2.3. Annual Compliance Cost Comparison Between the Final and Proposed Pesticide Containment Standards (2005$) 17
Table 2.4. Comparison of Benefits for the Proposed and Final Containment Standards (2005$) 18
Table 3.1. Industries Regulated by EPA's Containment Regulations 21
Table 3.2. Regulatory Compliance Baseline, Agricultural Pesticide Refillers and Commercial (Aerial and Ground) Applicators 26
Table 3.3. Representative Agricultural Pesticide Refilling Facilities, Bulk Pesticide Storage Containers and Pesticide Dispensing Areas [a] 39
Table 3.4. Economic Profile of Agricultural Pesticide Refillers by Entity Size 41
Table 3.5. Representative Agricultural Aerial Application Facilities, Bulk Pesticide Storage Containers, and Pesticide Dispensing Areas [a] 42
Table 4.1. Storage Area and Wall Height of Representative Agricultural Refiller Facilities 50
Table 4.2. Summary of Facility-Level Costs (2005$) to Install New Secondary Containment Units and Pads, Representative Agricultural Refiller and Commercial Applicator Facilities 54
Table 4.3. Summary of Annualized Costs for Compliance with Containment Regulations, Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators, [a] Install NEW Secondary Containment Units, 2005$, 3% Discount Rate 57
Table 4.4. Summary of Annualized Costs for Compliance with Containment Regulations, Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators, [a] Install NEW Secondary Containment Units, 2005$, 7% Discount Rate 58
Table 4.5. Summary of Annualized Costs for Compliance with Containment Regulations, Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators, Install NEW Secondary Containment Units and Pads, 2005$, 3% Discount Rate [a] 60
Table 4.6. Summary of Annualized Costs for Compliance with Containment Regulations, Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators, Install NEW Secondary Containment Units and Pads, 2005$, 7% Discount Rate [a] 61
Table 4.7. Summary of Annualized Costs to Install New Secondary Containment Units and Pads, Representative Agricultural Refillers, 3% Discount Rate 62
Table 4.8. Summary of Annualized Costs to Install New Secondary Containment Units and Pads, Representative Agricultural Refillers, 7% Discount Rate 63
Table 4.9. Summary of Annualized Costs to Install New Secondary Containment Units and Pads, Representative Commercial Applicator Facilities, 3% Discount Rate 67

Table 4.10. Summary of Annualized Costs to Install New Secondary Containment Units and Pads, Representative Commercial Applicator Facilities, 7% Discount Rate 68
Table 4.11. Summary of Facility-Level Costs (2005$) to Retrofit Existing Secondary Containment Units and Pads, Representative Agricultural Refillers and Commercial Applicator Facilities..... 73
Table 4.12. Summary of Aggregate Industry Annualized Costs (2005$) [a] to Retrofit Existing Secondary Containment Units and Pads and Liquid Bulk Containers for Representative Agricultural Refillers and Commercial Applicator Facilities, 3% Discount Rate..... 76
Table 4.13. Summary of Aggregate Industry Annualized Costs (2005$) [a] to Retrofit Existing Secondary Containment Units and Pads and Liquid Bulk Containers for Representative Agricultural Refillers and Commercial Applicator Facilities, 7% Discount Rate..... 77
Table 4.14. Summary of facility-level annualized costs to comply with containment regulations representative by facility size for agricultural refillers and commercial aerial and ground applicators to retrofit existing secondary containment units and pads, and liquid bulk containers (2005$), 3% discount rate 80
Table 4.15. Summary of facility-level annualized costs to comply with containment regulations representative by facility size for agricultural refillers and commercial aerial and ground applicators to retrofit existing secondary containment units and pads, and liquid bulk containers (2005$), 7% discount rate 80
Table 5.1. Annualized Industry Costs of Compliance Under EPA's Final Rule (2005$), 3% Discount Rate..... 84
Table 5.2. Annualized Industry Costs of Compliance under EPA's Final Rule (2005$), 7% Discount Rate..... 85
Table 5.3. Annualized Industry Costs of Compliance under EPA's Proposed Regulation 89
Figure 6.1. Flow Diagram of Potential Damages from Pesticide Containment Structures 99
Table 6.1. Reported Incidence of Spills from Pesticide Bulk Storage Facilities..... 101
Table 6.2. Pesticides Identified in Wells on or Near Agricultural Facilities in Illinois..... 104
Figure 6.2. The Costs and Benefits of Remediation (Cleanup) in the Baseline Scenario and the Calculation of the Benefits of Avoiding a Spill..... 110
Table 6.3. Estimation of Average Costs for Assessment and Remediation of Uncontrolled Spills at Agricultural Chemical Dealers and Applicators..... 114
Table 6.4. Potential Health Effects of Selected Pesticides 121

Appendix Tables

Table B.1. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for New Structures, Agricultural Refillers (2005$)..... 138
Table B.2. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for New Structures, Commercial Applicators (2005$)..... 140
Table B.3. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for New Structures, Agricultural Refillers and Commercial Applicators 141

Table B.4. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for Existing Structures, Small-Small Facilities 143
Table B.5. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for Existing Structures, Medium-Small Facilities 145
Table B.6. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for Existing Structures, Large-Small and Large Facilities 147
Table D.1. State Regulations of Bulk Pesticide Storage..... 157
Table E.1. Containment Proposed Rule Options Costs (2005$)..... 163
Table F.1. Comparison of Proposed and Final Standards for New Containment Structures..... 165
Table G.1. Estimated Number of Agricultural Pesticide Refillers by State, 1992 * 168
Table G.2. Regulatory Compliance Baseline for Agricultural Pesticide Refillers with Bulk Pesticide Storage ***..... 171
Table G.3. Number of Bulk Pesticide Containment Facilities to Install New Units and Pads* 175
Table G.4. Number of Bulk Pesticide Containment Facilities Affected by EPA's Containment Regulations to Retrofit Existing Containment Structures 177
Table H.1. Capital Costs of Compliance with Secondary Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Secondary Containment of Outdoor Bulk Liquid Pesticides, 2005$ [a]..... 179
Table H.2. Operating and Management (Annual) and Intermittent Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Secondary Containment of Outdoor Bulk Liquid Pesticides, 2005$ [a] 180
Table H.3. Capital Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facilities to Install NEW Secondary Containment of Indoor Bulk Liquid Pesticides, 2005$ [a] 181
Table H.4. Operating and Management and Intermittent Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facilities to Install NEW Secondary Containment of Indoor Bulk Liquid Pesticides, 2005$ [a] 182
Table H.5. Capital Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Secondary Containment of Stationary Dry Bulk Storage, 2005$ [a]..... 183
Table H.6. Operating and Management (Annual) and Intermittent Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facilities to Install NEW Secondary Containment of Stationary Dry Bulk Pesticide Storage, 2005$ [a] 184
Table H.7. Capital Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Outdoor Containment Units and Pads, 2005$ (Scenarios 1 & 2) [a] 185
Table H.8. Capital Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Containment Pads, 2005$ [a] 186

Table H.9. Operating and Management (Annual) and Intermittent Costs of Compliance with Containment Regulation for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Containment Pad Regulations for Indoor and Outdoor Storage Facilities, 2005$ [a] 188

Table H.10. Capital, O&M, and Intermittent Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, and Large-Small Commercial Aerial and Ground Applicator Facility to Install NEW Outdoor Secondary Containment Structures, 2005$ [a,b] 189

Table H.11. Capital, Initial, O&M and Intermittent Costs of Compliance with Containment Regulations by Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators to Retrofit EXISTING Secondary Containment Structures, 2005$ [a] 190

Table H.12. Capital, Initial, O&M and Intermittent Costs of Compliance with Containment Regulations by Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators to Retrofit EXISTING Containment Pads, 2005$ [f] 192

Table H.13. Capital, Initial, O&M and Intermittent Costs of Compliance with Containment Regulations by Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators to Retrofit EXISTING Liquid Bulk Containers, 2005$ [e] .. 194

Table I.1. Total Facility Annualized Costs as a Share of Annual Revenue to Install New Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 3% Discount Rate 196

Table I.2. Total Facility Annualized Costs as a Share of Annual Revenue to Install New Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 7% Discount Rate 198

Table I.3. Total Facility Annualized Costs as a Share of Annual Revenue to Retrofit Existing Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 3% Discount Rate 200

Table I.4. Total Facility Annualized Costs as a Share of Annual Revenue to Retrofit Existing Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 7% Discount Rate 202

Economic Analysis of
Bulk Pesticide Containment Structures Final Regulations

1.0 Introduction

The Environmental Protection Agency (EPA) is imposing requirements under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) for container design for pesticide containers. EPA is also imposing procedures, standards, and label language to facilitate removal of pesticides from containers prior to disposal. Additionally, EPA is imposing requirements for bulk pesticide containment and procedures for container refilling operations. These regulations are necessary to implement statutory authority requiring EPA to develop regulations for the safe storage and disposal of pesticides as a means of protecting human health and the environment.

Sections 19(e) and (f) of FIFRA grant EPA broad authority to establish standards and procedures to assure the safe use, reuse, storage, and disposal of pesticide containers. FIFRA Section 19(e) requires EPA to promulgate regulations for "the design of pesticide containers that will promote the safe storage and disposal of pesticides." The regulations must ensure, to the fullest extent practicable, that the containers:

(1) Accommodate procedures used for removal of pesticides from the containers and rinsing of the containers.
(2) Facilitate safe use of the containers, including elimination of splash and leakage.
(3) Facilitate safe disposal of the containers.
(4) Facilitate safe refill and reuse of the containers.

FIFRA Section 19(f) requires EPA to promulgate regulations "prescribing procedures and standards for the removal of pesticides from containers prior to disposal." The statute states that the regulations may:

(1) Specify, for each major type of pesticide container, procedures and standards for, at a minimum, triple rinsing or the equivalent degree of pesticide removal.
(2) Specify procedures that can be implemented promptly and easily in various circumstances and conditions.
(3) Provide for reuse, whenever practicable, or disposal of rinse water and residue.
(4) Be coordinated with requirements imposed under the Resource Conservation and Recovery Act (RCRA) for rinsing containers.

Section 19(f) also provides that EPA, in its discretion, may exempt products intended solely for household use.

Section 19(h), titled "Relationship to Solid Waste Disposal Act," specifies that nothing in Section 19 shall diminish the authorities or requirements of RCRA. Also, the Food Quality Protection Act (FQPA) of 1996 amended Section 19(h) of FIFRA to add an exemption for certain antimicrobial pesticides.

The following economic analysis (EA) is one of two economic analyses that estimate the costs and benefits of compliance with the regulations for the safe storage and disposal of pesticides. It presents the estimated costs and benefits of compliance with the bulk pesticide containment requirements of the final rule. The second EA provides estimates of the costs and benefits of

compliance with the pesticide container design and residue removal requirements of the final rule, including the container refilling requirements and the label language requirements for pesticide container residue removal.[1]

The bulk pesticide containment EA is organized into six chapters. The first two chapters present the regulatory background of the rule, a description of the final containment regulations, and a summary of the results of the EA. Chapters 3 presents the estimates of bulk storage facilities' compliance with the final pesticide containment regulations. Chapters 4 and 5 present the estimated costs of compliance with the final containment regulations. And Chapter 6 presents the estimated benefits of compliance with the final containment regulations. (Section 1.3 presents a more detailed description of the scope of the EA.)

1.1 The Need for Regulation

Past management practices associated with the bulk storage of pesticides have resulted in uncontrolled releases of pesticides into the environment. These releases have ranged from small-volume, chronic operational spills that occur when pipes, hoses, or other dispensing equipment leaks or fails to major, large-volume spills resulting from ruptured tanks.

Minor, small-volume spills are generally not reported to state or federal agencies and thus, not well-documented. However, there is ample evidence that chronic small spills have resulted in soil, surface water, and groundwater contamination at many agrichemical facility sites across the nation. The Illinois Department of Health found pesticide residues in groundwater samples from wells on or adjacent to 65–75 percent of the agrichemical dealerships sampled in the state (Long, 1989). Michigan's Department of Natural Resources documented 180 agriculture pollution incidents in the 1987 to 1991 period through their Pollution Emergency Alerting System (MDNR, 1991). A conservative estimate is that at least 8 percent of those reported incidents were related to pesticide storage or loading/refilling releases. Wisconsin's Department of Agriculture randomly selected 25 pesticide mixing and loading sites in the state and determined that 18 have significant soil contamination and nine have groundwater contamination above standards.

EPA analyzed data provided by the National Response Center for a reporting period of 1982 through May 1991 and identified 39 incidents in which spills appeared to be associated with bulk pesticide containers (USDHS, 2005). The reported quantities of pesticide released ranged from only 2 gallons to an estimated 1,000 gallons. The most frequent listed causes of spills as reported in this database are:

[1] Two separate economic analyses are conducted for the rule primarily because the standards for pesticide containers and the standards for containment of bulk pesticides are different, and, as a result, require two distinct economic analyses. That is, because the standards regulate different structures (containers versus bulk containment), and different industries (registrants, agricultural refillers, and swimming pool supply companies for the container standards; agricultural refillers and commercial pesticide applicators for the bulk containment standards), different assumptions and inputs will be used in the EA for each set of standards. Rather than creating a single, lengthy document containing two different economic analyses, the Agency chose to write a separate document for each EA.

- 36 percent transfer mishaps (e.g., hoses or couplings failing or dislodging during load-in or load-out);
- 31 percent appurtenance failure (e.g., leaks or breaks in pipes or valves, valves left open, sight gauge failure);
- 13 percent container failure (corroded, collapsed);
- 13 percent overfilling;
- 5 percent vandalism; and
- 2 percent cause not specified.

There are many case studies of spill incidents that have occurred at agrichemical facilities. For example, a firm in Lincoln, Nebraska, that conducts site assessments found high levels of nitrates and agricultural chemicals in the Ladd area of several agrichemical dealers. At one site, groundwater had not yet been affected, so the contaminated soil was removed and applied to a field according to the rate specified in the pesticide label. At another site, however, contamination had made its way into groundwater, and pumps were installed to remove all the contaminated water. Because the buyer of that particular property had been conducting operations at the site for several years, he and the seller negotiated, and settlement costs were in excess of $30,000 (Cole, 1991).

Examples of operator error and mechanical failures have also been documented. At an agrichemical facility, approximately 200,000 gallons of contaminated water were filtrated, with an equal amount incinerated when an employee forgot to turn off the recirculating pump in a bulk pesticides tank, and the pesticide ran off the site into surface water. The cost of cleanup was $184,000. A recirculation pump was also left on at another site, with cleanup costing $105,000 (Paulson, 1992). At another facility, the PVC plug on a bulk pesticide storage tank failed, releasing 1,200 gallons of herbicide. The cost of cleanup was $207,514 (Paulson, 1992).

In southern Louisiana, pesticide runoff from aerial applicator activities has been linked to kills of as many as one-half million fish and an unknown number of birds, turtles, and alligators at 13 sites. Three aerial applicators had their licenses suspended while investigations were conducted on mixing, loading, and rinsing procedures. The license of one of these operators was suspended because pesticide waters and rinsate were not contained and were allowed to discharge into a ditch. The operator will not be allowed to resume service until he has installed a "satisfactory washout and reclamation mechanism to eliminate runoff of unused chemicals into a nearby ditch" (*Pesticide & Toxic Chemical News,* 1991a,b; and Commission of Agriculture & Forestry, 1991).

The above examples demonstrate the need for containment structures to capture and contain any spill or leak that might occur in bulk pesticide storage. At new facilities, contamination can largely be avoided through good management practices such as secondary containment structures for bulk tanks and containment pads for mixing/loading, refilling refillable containers, rinsing containers and equipment, and similar activities. Use of containment pads in operational areas will prevent further contamination of soil and groundwater from chronic, low-volume spills at existing facilities.

1.2 Pesticide Container Design and Residue Removal and Containment Structures: Regulatory Background of the Final Rule

In a Notice of Proposed Rulemaking (NPRM) issued on February 11, 1994 (59 FR 6712), EPA proposed standards for pesticide containers and containment structures. This proposal included requirements for non-refillable and refillable containers that would ensure the safe use, refill, reuse, and disposal of the containers. The proposal also included standards for containment structures, which would promote safe storage of pesticides in bulk containers. Additionally, the proposed rule contained amendments to the labeling regulations in 40 CFR Part 156 to ensure adequate levels of residue removal from containers.

The public comment period for the NPRM closed on July 11, 1994. EPA received about 1,900 pages of comments from more than 200 commenters, including many trade associations and individual companies from the pesticide manufacturing, pesticide retail, and container manufacturing industries as well as many state regulatory agencies.

EPA received many comments during the public comment period on a few issues; in particular, the scope of the container standards and the relationship between the 1994 proposed rule and the Department of Transportation (DOT) standards for hazardous materials packaging. A third issue arose from the 1996 passage of the FQPA, which amended Section 19(h) of FIFRA to add an exemption for certain antimicrobial pesticides. To solicit comment on EPA's interpretation of the new statutory language on exempting antimicrobial pesticides and to reopen comment on the scope of the container regulations and an approach for incorporating DOT's standards, EPA published a supplemental notice in the *Federal Register* (EPA, 1999). The notice also provided an alternative definition of small business for certain sectors of the pesticide industry for use in analyzing the potential impacts to small businesses that were presented as part of the economic analysis.[2]

The public comment period for the supplemental notice closed on March 20, 2000. EPA received comments from about 70 respondents, including many trade associations and individual companies from the pesticide manufacturing, pesticide retail, and container manufacturing industries as well as many state regulatory agencies.

On June 30, 2004, EPA reopened the comment period for 45 days to solicit public input on any policies, market practices, technology, or other issues relating to this rule's requirements that would not have been available, or could not have been addressed, at the time of either the proposed rule in 1994 or the supplemental notice in 1999. While EPA has attempted to stay current on developments in pesticide container and containment structure policies, regulations, technology, and practices, the Agency believed that it was appropriate to solicit input from the regulated community, state regulators, and others to ensure full awareness of the current state of the pesticide container and containment universe before finalizing the pesticide container and

[2] As discussed by EPA in the 1999 Supplemental Notice on Standards for Pesticide Containers and Containment (EPA, 1999b), the alternative definition disaggregates small businesses as defined by the Small Business Administration (SBA) into three size categories: small-small, medium-small, and large-small businesses. EPA is concerned that using an overly broad definition of small business in the economic analysis of the regulations may result in significant economic impacts on smaller entities that will be camouflaged when combined with information about potential impacts on facilities that meet the SBA size standard for small business but are not typical of a small business in that industry sector. (See Chapter 3 for industry-specific small business definitions.)

containment regulations. The comment period generated 50 comments mainly from pesticide manufacturers, state regulatory agencies, and agricultural pesticide dealers. (See the preamble to the proposed rule and Section 2.3 of this document for a more complete discussion of comments received by EPA.)

Prior to 1995, recommendations regarding procedures for storage and disposal of pesticides and pesticide containers were listed under 40 CFR Part 165. On June 19, 1995, as part of the federal government's initiative to streamline regulations, Part 165 was deleted as unnecessary (60 FR 32094) because it contained recommendations rather than requirements. Subpart A of Part 165 covered the scope and definitions in the recommendations. Subpart B dealt with EPA's disposal of suspended and canceled pesticides, and EPA has completed disposal of all pesticides for which it was responsible under those regulations. Subparts C and D contained recommended procedures for storage and disposal of pesticide containers. Subparts A, B, C, and D were superseded by the passage of the Resource Conservation and Recovery Act in 1976. FIFRA Section 19, as revised in 1988 and 1996, contains authority for EPA in the area of pesticide storage and disposal, and the final pesticide container and containment regulations promulgated are being inserted into a newly established Part 165.

1.3 Scope of the Economic Analysis for the Final Pesticide Containment Regulations

The EA conducted for the final pesticide containment regulations estimates the costs and benefits of compliance (installation of new containment structures and retrofitting of existing containment structures) for the regulated community. The components of the EA for the final pesticide containment regulations include:

(1) A profile of the regulated community (i.e., agricultural pesticide refillers and commercial applicators). This includes specific economic characteristics of each industry regulated under the containment regulations—such as North American Industry Classification System (NAICS) codes, the average company size, revenues for the average company, total industry revenues, the distribution of firms between small and large—to be used to estimate the costs and impacts of the containment regulations. (See Chapter 3.)

(2) A profile of bulk pesticide storage facilities' compliance with the final containment regulations. The profile contains the estimates and analysis of the baseline estimated number of bulk containment facilities and the estimated number of facilities not in compliance with the final regulations, which will either have to install new containment structures or retrofit existing structures to come into compliance. (See Chapter 3.)

(3) An analysis of the cost of compliance with the final pesticide containment regulations. The analysis includes the methodology for calculating the costs of compliance and the estimates of the costs:

   (a) to install new secondary containment units and containment pads; and

   (b) to retrofit existing secondary containment units and containment pads.

   The estimated costs are presented at different levels of aggregation for all regulated industries, each industry, and for representative facilities in each industry. (See Chapters 4 and 5.)

(4) An analysis of the small business impacts of compliance with the final pesticide containment regulations for each regulated industry. These impacts are presented using both the Small Business Administration (SBA) definition of a small business, and the alternative definition

of a small business adopted specifically for this rule.[3] Impacts are estimated as the proportion of increased facility costs to current facility revenues. (See Chapter 5.)

(5) An analysis of the human and environmental benefits of compliance with the final pesticide containment regulations. Benefits are measured in terms of the avoided costs of remediation following a release from a bulk pesticide storage facility. (See Chapter 6.)

1.4 Estimated Costs and Benefits of Compliance with the Final Pesticide Containment Regulations

The pesticide containment regulations certify a number of standards that create costs to the regulated community of bringing bulk pesticide storage facilities into compliance with the containment regulations, as well as benefits to humans and the environment. Improvements in containment of bulk pesticides will benefit humans and the environment by reducing the contamination of soil and water resources from unintended bulk pesticide releases.

The total annualized costs of compliance with the final pesticide containment regulations are estimated to be approximately $2.93 million and $2.90 million at a 3 percent and a 7 percent discount rate, respectively,[4] while the total estimated annualized benefits range from $12.2 million to $18.6 million (see Table 1.1). More than 90 percent (or $2.69 million) of the total cost of compliance is from the construction of new containment structures, and the remaining 10 percent (or $0.25 million) is from retrofitting existing containment structures. The estimated cost to agricultural refillers is $2.71 million, while commercial applicators are estimated to face costs of $0.23 million.

States also face costs of compliance with the final regulations in the first year. For the 19 States that currently have bulk pesticide containment structures regulations, total costs are estimated to be approximately $8,000 to prepare documentation that their regulations provide environmental protection equivalent to the federal regulations. For the remaining 31 States without regulations, total costs are estimated to be approximately $5,500 to comply with the recordkeeping requirements of the final regulations. (See Chapters 4 and 5 for specific cost information.)

The benefits of compliance with the final containment regulations include the cost savings from avoiding cleanup of spills from bulk pesticide storage areas. Because data are not available on human and environmental effects from pesticide exposure due to bulk pesticide containment–related spills, the estimated benefits do not include the benefits of the final containment regulations to humans and the environment. However, it is expected that these benefits could be significant (see Chapter 6 for a description of the benefits of the final regulations for bulk pesticide containment).

[3] See footnote 2.

[4] For ease of presentation, we will present only the estimates using the 3 percent discount rate for the remainder of the analysis in this chapter. Chapters 4 and 5 present the estimated costs of compliance with the final containment regulations at both the 3 percent and 7 percent rates. The estimated costs at the two different rates are similar because the majority of the estimated costs of compliance are incurred in the first year of compliance as capital or initial costs of compliance.

Table 1.1. Quantified Costs and Benefits of the Final Containment Regulations (2005$) [a]

Quantified Cost/Benefit Category	Annualized Cost/Benefit at a 3% Discount Rate	Annualized Cost/Benefit at a 7% Discount Rate
Total Quantified Costs	$2.93 million	$2.90 million
Construction of New Containment Facilities	$2.69 million	$2.66 million
Retrofitting of Existing Containment Structures	$0.25 million	$0.24 million
Total Quantified Benefits	$12.2 million–$18.6 million	$12.2 million–$18.6 million

[a] Benefits that have not been quantified include the adverse effects to humans and the environment from exposure to pesticides as a result of spills and leaks of pesticides at bulk pesticide storage facilities. Total may not add because of rounding.

Having presented the statutory basis for the promulgation of the final rule on pesticide containment structures, a summary of the regulatory history of the standards, and a summary of the results of the EA in this introductory chapter, the remaining chapters of the EA present the analysis of the impacts on the regulated industries of the final bulk pesticide containment regulations. Chapter 2 presents a description of the final standards for bulk pesticide containment structures and the changes in the standards from the proposed to the final rule. Chapter 2 is followed by analyses of compliance of bulk pesticide containment facilities with the final regulations (Chapter 3), of the costs of compliance with the final regulations (Chapters 4 and 5), and of the benefits of compliance with the final regulations (Chapter 6).

2.0 Final Bulk Pesticide Containment Regulations and Changes in the Regulations from the Proposed to Final Rule

Chapter 1 presented the regulatory history of the pesticide container and bulk pesticide containment rule, an analysis of the scope of the EA for the final bulk pesticide containment regulations, and a summary of the results of the EA. In Chapter 2, the response to comments to the proposed standards, the economic impacts (i.e., the change in the costs and benefits of compliance) of the changes from the proposed to the final standards and the final bulk pesticide containment regulations are presented. These are the standards for which compliance with the final regulations is estimated for bulk pesticide storage facilities in Chapter 3, and for which the costs of compliance are estimated in Chapters 4 and 5, and the benefits of compliance are estimated in Chapter 6. Chapter 2 also presents a description of the changes made in the bulk pesticide containment regulations from proposed to final.

2.1 Final Bulk Pesticide Containment Regulations

EPA's final pesticide containment regulations include criteria for design, maintenance, and operation of bulk pesticide containment structures at agricultural facilities. These criteria are intended to provide national standards that will introduce basic safeguards in states that currently lack containment regulations and reinforce containment requirements in states where containment safety programs already exist. The Agency believes that the federal containment standards, together with requirements for federal container design and residue removal, are essential for ensuring the safe use, reuse, and refilling of pesticide containers as required under FIFRA Section 19.

The final pesticide containment rule defines "bulk" storage requirements for both liquid and dry agricultural pesticides, and specifies standards for containment structures, including secondary containment units for stationary bulk containers and containment pads for pesticide dispensing activities. "Stationary bulk containers" are defined as any bulk containers that hold pesticides, including transport vehicles (e.g., trucks and railcars). The following qualify as bulk containers and require secondary containment:

- Containers with capacity to store liquid pesticides greater than 1,893 liters (500 gallons);
- Containers with capacity to store dry pesticides greater than 1,814 kilograms (4,000 pounds); and
- Mobile containers with capacity greater than 500 gallons or 4000 pounds (only if they remain more than 30 days at one location).

Under the rule, a "containment structure" is defined to mean either a secondary containment unit or a containment pad. For compliance, certain stationary bulk containers require a "secondary containment unit," which refers to a backup containment structure to protect against leaks or spills from the bulk container. Such leaks could range from relatively small volumes (e.g., slow drips from a poorly sealed valve) to the release of the entire contents of the bulk container, such as during a container failure. The rule also outlines requirements for pesticide dispensing areas, and covers certain areas where pesticides are transferred out of or into a container or other vessel. Besides containers, the vessels from which or into which the pesticide is transferred may include application equipment and transport vehicles. The pesticide being transferred can be in

the form "as sold and distributed" or in diluted form for field application and/or container cleaning operations.

Certain pesticide dispensing areas will require protection by a containment pad, which is a structure that provides a means of spill control at a dispensing area. Under the rule, a containment pad can be separate or constructed as an integral component of a secondary unit.

Separate categories of requirements are discussed in greater detail in the following sections.

2.2 Standards for New and Existing Pesticide Containment Structures

Until now, the containment of bulk pesticides has been guided only by an interrelated combination of federal regulations[5] and state regulations (see Appendix D for a complete discussion of these standards). These regulations and standards form the basis for the pesticide containment regulations. The result is that with a large set of standards already in existence, the pesticide containment rule is primarily a harmonizing and consolidation exercise, and EPA estimates that most bulk pesticide storage facilities are in compliance with many aspects of the rule because these facilities are already meeting a variety of other standards, as discussed in more detail in the pesticide containment compliance profile (see Chapter 3).

The pesticide containment regulations as described below are the end result of revisions made to the 1994 proposed standards for pesticide containment structures, based on the public comments submitted and discussions with a number of interested parties, including other EPA offices, government agencies, and the regulated community (see Section 2.3 and Appendix F for a description of the changes made in the containment regulations between the proposed and the final rule).

The final pesticide containment regulations are divided into two parts: (1) critical performance-based standards for existing structures, and (2) standards for new structures. These standards, as well as existing state standards and their consideration in the final rule, are discussed below.

2.2.1 Final Critical, Performance-Based Criteria for Existing Containment Structures

Under the final rule, all existing containment structures must meet EPA's critical standards (Table 2.1). The Agency believes the critical standards will ensure human and environmental protection while avoiding excessive retrofitting costs. Based on its *State of the States Report* (EPA, 1992) and its own review of the text of state regulations (Appendix C), EPA believes the critical standards and existing state standards are comparable. Existing structures in states with or without state standards are required to comply with the critical standards within 2 years after promulgation of the final rule.

The Agency considers the critical standards to be the minimum requirements needed to ensure adequate environmental protection. States have the option of requiring existing structures to meet the full federal standards instead. Given that monthly inspections and recordkeeping must occur, documentation of a facility's performance will be available, and states will be able to make decisions on problematic containment structures on a case-by-case basis. EPA is also

[5] Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and others.

encouraging states to require that any structure that must undergo significant upgrading to comply with the critical standards must instead comply with the full federal standards. Additionally, EPA recommends that states require that any structure enlarged by more than 50 percent capacity or having a record of frequent spills or environmental contamination be upgraded to comply with the full federal standards.

Table 2.1. Critical Standards for Existing Containment Structures

(1) Bulk storage containers must be located within a rigid, liquid tight secondary containment facility, free of visible cracks and defects. Cracks and gaps must be repaired, and no pesticide must be stored or dispensed within the structure until suitable repairs have been made.
(2) The facility must be constructed with pesticide-compatible materials, such as steel or concrete, and be leakproof with seams and joints sealed. [a]
(3) Storage containers and appurtenances, including pipes, must be protected against damage from operating personnel and moving equipment.
(4) At least monthly during periods when pesticides are being stored or dispensed, the owner/operator must inspect each bulk container and its appurtenances and containment structure for visible signs of leakage.
(5) Spills and leaks must be collected and cleaned up no later than the end of the day on which they occurred. The structure must be operated in a way that prevents pesticides or material containing pesticides from escaping from the containment structure.
(6) The secondary containment for bulk liquid pesticides must have a volume sufficient to contain the capacity of 100 percent of the single largest container within it, plus the displaced volume of other containers and appurtenances.
(7) The secondary containment for bulk dry pesticides must be protected from wind and precipitation, and be placed on pallets or a raised concrete platform to prevent the accumulation of water in or under the pesticide. The storage area must be enclosed by a minimum of a six-inch high curb that extends at least two feet beyond the perimeter of the bulk container.
(8) Pads for operational area containment must be of adequate design and size to contain a minimum of 750 gallons of discharged liquid.
(9) Containment pads must have a means of removing and recovering spilled material or rainfall, such as by a pump. Automatic pumps without automatic overflow cutoff switches are prohibited.
(10) All pesticide transfers must be attended, and lockable valves, if required by §165.124, must be locked.

[a] Some state regulatory agencies define "chemically compatible" as the ability of the containment structure materials to withstand anticipated exposure to stored or transferred materials without losing their ability to provide the required containment.

2.2.2 Final Standards for New Pesticide Containment Structures

New structures are required to comply with the full federal standards, which are slightly more detailed and stringent than the critical standards. All of the critical standards are required of new structures as well. Standards different from or additional to the critical standards are illustrated in Table 2.2.

Table 2.2. Bulk Pesticide Containment Standards in Addition to the Critical Standards for New Containment Structures

(1) Secondary containment for bulk liquid pesticides without protection from precipitation must have a volume sufficient to contain the capacity of 110 percent of the single largest container within it, plus the displaced volume of other containers and appurtenances. Secondary containment for bulk liquid pesticides with protection from precipitation must have a volume sufficient to contain the capacity of 100 percent of the single largest container within it, plus the displaced volume of other containers and appurtenances.
(2) Containment pads must be sloped to a liquid-tight sump where liquids can be collected for removal.
(3) No appurtenance, discharge outlet, or gravity drain is allowed through the base or wall, except for direct interconnections between adjacent containment structures that meet the standards.
(4) Appurtenances must be configured so that spills or leaks can be readily observed.

2.2.3 State Pesticide Containment Standards

The Agency believes that national standards are necessary, but recognizes the proactive efforts many states have made in implementing their own containment regulations, as well as the substantial financial investments made by facilities in complying with those regulations. Due to concern that not all states may have regulations that ensure an acceptable level of environmental protection, EPA conducted an extensive review of existing state regulations (Appendix C). EPA determined that all regulations, as written, seem to provide equivalent protection (Appendix C), with the possible exception of states that allow use of earth or asphalt as the construction material. Three states (Minnesota, Vermont, and Wisconsin) specifically allow earth or asphalt secondary containment with liners, and six other states (Kansas, Louisiana, Missouri, North Dakota, Ohio, and West Virginia) do not specify construction material but give general performance standards that could be met by lined earth or asphalt. There is evidence that lined earthen berms in these states are used principally, if not exclusively, for fertilizer storage. While EPA has no evidence that earth or asphalt with an impermeable liner provides insufficient spill protection, the final rule is maintaining a more conservative approach by requiring "reinforced concrete or other rigid, liquid-tight materials." The Agency determined that despite considerable variation, most of the 19 states with existing regulations appear to provide equivalent or more stringent environmental safeguards in their containment programs.

The Agency has decided that states with containment regulations already in place may petition EPA to make a determination of equivalency of their regulations to the federal containment regulations. States wishing to request an equivalency determination may submit correspondence to EPA, accompanied by any supporting documentation, indicating that the state's program (for both existing and new structures) provides environmental protection equivalent to that provided by EPA's containment regulations. If EPA agrees, states will be provided with correspondence authorizing them to continue implementation of their state containment program in lieu of the federal standards.

Facilities in states without containment regulations must comply with federal requirements for both new and existing structures. Some existing facilities will incur expenses to meet the critical standards, and all new facilities will have to comply with the full standards. EPA expects this rule to affect agricultural pesticide refillers; namely, agrichemical dealers and commercial (for-hire) agricultural applicator businesses.

Compared to other options that would require states to change their regulations or require facilities to retrofit to the full standards, EPA has decided that the chosen approach will be less burdensome for states and for existing facilities.

2.3 Changes in the Final Pesticide Containment Regulations from the Proposed to the Final Rule

As previously mentioned, EPA received approximately 1,900 pages of comments from more than 200 commenters (e.g., trade associations, pesticide manufacturers, pesticide retailers, and many state regulatory agencies) on the proposed rule. Based on these comments, EPA made a number of changes to the proposed regulations. The most significant of these changes for the final rule are as follows:

(1) The final rule deletes hydraulic conductivity standards and associated recordkeeping and inventory reconciliation.
(2) The final rule deletes the interim standards, and establishes a set of standards for existing structures and more stringent full standards for new structures.
(3) The final rule adjusts capacity standards for new and existing structures.
(4) The final rule reduces recordkeeping responsibilities.
(5) The final rule changes the size requirement of bulk containers.

As a result of these and other changes (as discussed below and in Appendix F), the estimated economic impacts on the regulated community under the final regulations will be different from the estimated economic impacts under the proposed regulations (see Chapters 5 and 6 for a comparison of the estimated costs and benefits of the proposed and final regulations, respectively). The changes made to the proposed containment regulations are described under the following main areas: (1) general requirements (Section 2.3.1); (2) capacity standards (Section 2.3.2); (3) interim standards (Section 2.3.3); and (4) scope of the standards (Section 2.3.4).

2.3.1 General Requirements

Comments received by EPA pertaining to the proposed rule's general requirements are divided into five groups: (1) containment design, (2) standards for sumps, (3) recordkeeping, (4) rainwater management and (5) rinsate management.

Containment Design. The proposed rule required that containment structures be sufficiently resistant to penetration by pesticides to prevent leaching and release. It specified that structures had to meet specific quantitative criteria for hydraulic conductivity (1×10^{-6} cm/sec for existing structures and 1×10^{-7} cm/sec for new structures) (§165.146). Well-constructed concrete has been demonstrated to have a hydraulic conductivity of 1×10^{-7} cm/sec or less, the standard proposed for wood preservative drip pads under RCRA. Few state regulations require a hydraulic conductivity standard, and most that do cite a value of 1×10^{-6} cm/sec for liners. The proposed rule also required that containment walls be pesticide-resistant, and that containment units be constructed of reinforced concrete or other rigid material capable of withstanding the full hydrostatic head, load, and impact of any pesticides, equipment, and appurtenances placed within the structure (§165.146).

Based on an analysis of the public comments submitted and current technology, the Agency determined that use of a numeric hydraulic conductivity standard for secondary containment would be unnecessarily burdensome. For the final rule, EPA decided to eliminate the hydraulic conductivity standard from the requirements since such a numeric standard would result in a substantial increase in cost without a demonstrable equivalent benefit for environmental safety. Furthermore, compliance with this standard could not be readily proven on existing structures. Instead, based on state agency comments, EPA decided that effective pesticide secondary containment by the structures would be satisfactorily achieved if properly constructed, maintained, and inspected. Field experience with existing state standards further indicates that the requirement for a hydraulic conductivity standard would be excessive. The regulatory language in the final rule therefore eliminates any reference to the hydraulic conductivity standard or the interim period. The word "resistant" was replaced with "compatible," due to comments by states that "pesticide-resistant" would be difficult to define, and that compatible can be defined as a material's ability to withstand anticipated exposure to stored or transferred materials.

Sump Standards. The proposed rule required that the base of a containment pad slope toward a liquid-tight sump (for new but not existing pads), as well as requiring a method for removing accumulated liquids (§165.152(b)(2)). The standards prohibited any automatically activated pumps that lack automatic overflow cutoff switches for the receiving container. EPA requested comments on whether performance criteria for the sump should differ from general containment requirements.

For the final regulations, EPA concluded that since the general standards for containment structures also apply to sumps, which are an integral part of the containment structure, sumps must be liquid-tight with sealed seams and joints. Since spills and leaks must be collected and cleaned up no later than the end of the day on which they occurred, sumps would not be allowed to retain leaked pesticides or wash water. However, even a regularly cleaned sump may contaminate surrounding areas if it is not liquid-tight. The Agency concluded that the sump's adherence to the standard could be demonstrated in a number of ways, although compliance monitoring will be left to local enforcement officials familiar with conditions in their area.

Recordkeeping. The proposed rule required facilities to maintain records on inspection, maintenance, and monthly inventory reconciliation of containment structures for at least 3 years. Records were also required for bulk containers not protected by secondary containment, including records on their duration at the same location (§165.157). The rule proposed that facilities would have to maintain written confirmation of hydraulic conductivity as long as the containment structure was in use and for 3 years thereafter. Monthly inventory reconciliation was required only during the proposed interim period as a means to detect leakage from bulk containers that are difficult to inspect for leaks (e.g., containers that are not elevated).

For the final rule, EPA retained the requirement for recordkeeping of monthly containment inspections as a necessary standard procedure. However, since the numerical hydraulic conductivity standard was eliminated from the final rule requirements, recordkeeping on that issue and on inventory reconciliation is no longer required. In response to comments on the rule's proposed residence time, the Agency decided to raise the residence time for non-fixed bulk containers to 30 days. Bulk container status, including residence time, will be included in the

monthly inspection recordkeeping, providing relief to facilities from circumstances outside their control.

Rainwater Management. Precipitation may enter a containment structure either directly or through stormwater runoff from surrounding land or structures. EPA is especially concerned about containment structures on poorly drained areas. To reduce stormwater runoff, the proposed rule required that containment be designed, at a minimum, to prevent liquids from seeping into it or flowing onto it from adjacent land or structures during a 25-year, 24-hour rainfall event (§165.146(b)(1)). The 25-year, 24-hour storm criterion is used by the National Pollution Discharge Elimination System (NPDES) as a standard for containment structures, and some states have adopted it as a standard for pesticide secondary containment.[6]

After reviewing the comments to the proposed rule, the Agency decided not to require a 25-year, 24-hour storm criterion. This is consistent with the final EPA rule on Oil Pollution Prevention and Response: Non-Transportation-Related Onshore and Offshore Facilities (67 FR 47042, July 17, 2002). The oil pollution prevention rule states that while a 25-year, 24-hour storm event standard is appropriate for most facilities and protective of the environment, it may be difficult and expensive for some facilities to secure recent information concerning such storm events at this time. Recent data do not exist for all areas of the United States, or may be costly for small operators to secure. Instead, at this time, the final rule requires that the containment structure have sufficient freeboard to contain precipitation and prevent water and other liquids from seeping into or flowing onto it from adjacent land or structures. Most states with containment regulations do not use a 25-year, 24-hour storm criterion and have indicated that in their experience, requiring a numerical capacity (110 percent) or sufficient freeboard to accommodate local precipitation conditions provides adequate protection.

Rinsate Management. The proposed rule specifically exempted bulk containers containing rinsates or wash waters from the requirement for secondary containment, because EPA did not have sufficient information on the risks from storage of such dilute pesticides (§165.142).

The final rule recommends but does not require that new facilities place rinsate tanks within secondary containment. State regulations can be more stringent and require rinsate tanks within secondary containment, if they deem it necessary. During the rule's implementation, EPA will work with states and industry to develop guidance on good management practices, including a recommendation that rinsate tanks be placed on or in secondary containment. The Agency believes that many existing structures are not constructed to accommodate rinsate tanks, and that the low potential risk from release of such dilute solutions does not warrant a regulation that may be economically burdensome. EPA expects that rinsate is used as a diluent and that facilities typically maintain low rinsate inventories. In new facilities that wish to follow the recommendations (or that are required to do so by state law), somewhat larger secondary containment will incur minor additional costs to account for the volume of the rinsate tank (usually not the largest tank within the containment).

[6] The standard represents a 24-hour rainfall event with a probable recurrence interval of once in 25 years (National Weather Service, 1961).

2.3.2 Capacity Standards

The proposed containment rule specified capacity standards for liquid bulk containers, dry bulk containers, and containment pads. The following are summaries of the proposed standards as well as EPA's decision for the final rule.

Liquid Bulk. For liquid bulk pesticides in outdoor facilities, EPA's proposed permanent standards required that secondary containment structures have a minimum holding capacity of at least 125 percent of the volume of the largest container, plus the displaced volume of other containers and appurtenances. For indoor facilities not exposed to precipitation, a capacity of 110 percent of the largest container volume plus the displaced volume was required. During the interim period, capacity requirements were proposed at 110 percent (outdoor) and 100 percent (indoor) of the volume of the largest pesticide container plus the displaced volume.

EPA believes that many of the public comments on the proposed capacity standards for liquid pesticide containment presented reasonable alternatives to the proposed rule. Existing outdoor facilities with 110 percent capacity have had no reported overflows. The proposed 125 percent capacity for outdoor liquid bulk can be reduced to 110 percent without sacrificing environmental protection. The alternative of a six-inch freeboard (approximately equal to a 25-year, 24-hour storm capacity in certain states) would be inappropriate for dryer states. Although it is unlikely (but possible) that a heavy storm would occur on the same day as the complete failure of a completely full tank, the extra 10 percent capacity is easily calculated and will ensure that such an event would not result in overflow. An extra 10 percent is not needed indoors as long as the displaced volume of other tanks and appurtenances within the containment has been included. Thus, EPA decided to retain the 110 percent (outdoor) and 100 percent (indoor) capacity requirement for bulk liquid pesticide storage for both new and existing facilities.

Dry Bulk. For dry bulk pesticides, EPA's proposed standards required that secondary containment structures have a minimum holding capacity of at least 100 percent of the largest dry bulk container plus any displaced volume.

The Agency believes that the public comments submitted on this issue provide adequate justification for treating dry bulk differently than liquid bulk. Instead of specifying a percent capacity requirement, the final rule requires that dry pesticides be protected from wind and rain by being raised on pallets or a concrete platform to prevent the flow of water in or under the pesticide. The structure must be enclosed by a six-inch high curb that extends at least two feet beyond the perimeter of the container.

Pads. The proposed standards for new structures required that all containment pads have a minimum holding capacity of 1,000 gallons. If no equipment used on the pad exceeded 1,000 gallons, then at least 100 percent of the capacity of the largest equipment used on the pad was required.

After reviewing public comments on the proposed capacity standards for containment pads, the Agency agreed that there was little documentation to support a choice of a 1,000 gallon capacity, and little difference, in function, between a 1,000 gallon pad and a 750-gallon pad. The final rule requires a pad capacity of 750 gallons, or, if no container on the pad exceeds 750 gallons, a minimum capacity of 100 percent of the volume of the largest container or pesticide-holding

equipment on the pad. The Agency believes that such a pad will provide environmental protection, since the requirement that transfers be attended by an operator makes it unlikely that an entire tank or nurse truck would empty onto the pad before remedial action could be taken.

2.3.3 Interim Standards for Existing Structures

EPA's proposal specified requirements for new and existing containment structures and pads by describing full and interim standards, respectively. A number of requirements applied to both new and existing containment structures and pads, applicable after a 2-year "interim" period, including: (1) construction with rigid materials; (2) use of pesticide-resistant materials; (3) stormwater run-on protection for a 25-year, 24-hour storm; (4) anchoring of non-elevated bulk containers; (5) protection of appurtenances and containers; (6) sealed joints and cracks; (7) capacity requirements; and (8) hydraulic conductivity less than or equal to 1×10^{-6} cm/sec. Standards applicable to new structures after the first 2 years and existing structures after an additional 8-year "interim" period included: (1) hydraulic conductivity less than or equal to 1×10^{-7} cm/sec; (2) plumbing configured to facilitate leak detection; (3) no drains or pipes penetrating the containment structure; (4) minimum secondary containment capacity based on 110 percent/125 percent (indoors/outdoors) of the largest liquid container and on 100 percent of the largest dry bulk container; (5) bulk containers elevated for leak observation; and (6) pads sloped to sumps.

After reviewing the public comments, the Agency agrees that the interim standards and interim period are less desirable than some of the suggested alternatives. The Agency considered grandfathering all existing structures, but was concerned that some substandard structures might be allowed to operate virtually "forever" without a need to retrofit. Although the Agency estimates that more than 80 percent of containment structures and pads are in states with containment regulations, there remain many pesticide storage facilities that require secondary containment structures and pads in non-regulated states. Grandfathering these structures with no time limit for compliance would have presented unknown environmental risks. The Agency therefore decided to promulgate two sets of permanent standards, one for existing and one for new structures. For any existing facilities that must undergo significant renovations to comply with the critical standards, EPA is recommending that states encourage such facilities to make the additional effort to come into compliance with the full standards. States continue to have the option of requiring existing structures to comply with the full federal standards. To accommodate states with containment regulations already in place, the Agency is allowing states to petition for an equivalency determination (discussed in Section 2.2.3).

2.3.4 Scope of the Containment Regulations

The proposed scope was based on EPA's ability to characterize the potential contamination problems at bulk pesticide storage facilities, incorporating evidence of contamination and a reasonably accurate estimate of the number of each type of facility. The scope under the proposed rule included retail refillers and commercial applicators with bulk agricultural pesticides but specifically excluded some groups, including farms, distributor/registrants, and non-agricultural facilities.

For the final rule, EPA decided to keep the scope the same as in the proposal, since commenters did not provide sufficient evidence of contamination or other problems at these facilities.

However, if a pervasive pattern of contamination or other handling problems at any of the excluded sites arises, EPA will consider the need for future federal regulation at that time.

In the proposed scope, containers that hold undivided quantities of agricultural pesticides greater than 793 gallons of liquid pesticide or greater than 4,409 pounds of dry pesticide were subject to the containment regulations. Many commenters recommended reducing the capacity threshold for containers for which secondary containment is required. Based on these comments, the Agency has decided to reduce the capacity threshold to 500 gallons for containers holding liquid pesticide and to 4,000 pounds for containers holding dry pesticides.

As modified, the final bulk pesticide containment standards form the basis for the remainder of the analysis.

2.4 Comparison of the Estimated Costs and Benefits of the Final and Proposed Standards

As described in Section 2.3, EPA made a number of significant changes to the pesticide container standards from the proposed to the final standards. As a result, there are differences in the level of compliance with these standards, leading to differences in the estimated costs and benefits of compliance with the pesticide containment standards between the proposed and final rule. Tables 2.3 and 2.4 present the estimated costs and benefits of compliance for the final and proposed pesticide containment standards.

Table 2.3. Annual Compliance Cost Comparison Between the Final and Proposed Pesticide Containment Standards (2005$)

Cost Item	Compliance Cost for Final Containment Standards [a]	Compliance Cost for Proposed Containment Standards [b]
Total Cost of Compliance	$2.94 million	$12.96 million
Total Cost of Compliance by Regulated Industry		
Agricultural Pesticide Refillers	$2.71 million	$10.82 million
Commercial Applicators	$0.23 million	$2.14 million
Total Cost of Compliance by Standard		
New Containment Structures	$2.69 million	$9.71 million
Retrofitting Existing Containment Structures	$0.25 million	$3.25 million

[a] Cost based on 3 percent discount rate. See Chapter 4 and 5 for the cost analysis of the pesticide containment regulations.

[b] Based on the costs estimated for Regulatory Option 2 in the proposed rule RIA for pesticide containers, which was EPA's preferred option in the proposed rule. The figures are inflated to 2005 dollars to account for general price inflation over the period using CPI-U "All Items" (BLS, 2005)

The total cost of compliance with the final standards is estimated to be lower than the estimated total cost of compliance with the proposed standards (see Table 2.3). This is primarily the result of the changes in the rule requirements from the proposed to final rule. One of the significant changes between the proposed and final pesticide containment rule is the elimination of the interim period requirements to retrofit existing structures and also elimination of the more costly requirements of the proposed rule, such as the hydraulic conductivity standard and reduction in the capacity requirements. The annualized cost of the final rule is also lower because it extends the time for which costs are calculated from a 15-year period to a 20-year period. Differences

between estimated costs of the proposed and final rules are also partially attributable to the fact that more states regulate pesticide bulk storage facilities. However, the bulk of reduction in costs is due to changes in regulatory requirements rather than changes in the size of the regulated community. Chapters 4 and 5 present more details on the specific cost items for the final and proposed rule.

Table 2.4. Comparison of Benefits for the Proposed and Final Containment Standards (2005$)

Benefit Category	Final Containment Standards [a]	Proposed Containment Standards [b]
Human Health-Related Benefits		
Not Estimated		
Non-Human Health-Related Benefits		
Probability of Release	• 1%	• 1.5%
Facilities with Accidental Release	• 5811 facilities	• 3000 facilities
Avoided Costs of Remediation	• $12.2 million to $18.6 million	• $9.3 million to $15.6 million

[a] See Chapter 6.
[b] The figures are inflated to 2005 dollars to account for general price inflation over the period using CPI-U "All Items" (BLS, 2005).

The benefits from the final containment regulations exceed those from the proposed containment regulations, with the estimated benefits ranging from $12.2 million to $18.6 million under the final rule as compared to $9.3 million to $15.6 million from the proposed regulation (see Table 2.4). The differences arise because of the assumptions used in the calculation of avoided costs of remediation (see Chapter 6).

In summary, Chapter 2 presented the final bulk pesticide containment regulations. Specific details of the containment regulation standards were described for both the new and existing containment structures. Changes in regulation from the proposed to the final standards were also presented. The most significant changes included deletion of the hydraulic conductivity standards, deletion of the interim standards and more stringent full standards for new structures. The final rule also adjusts capacity standards for new and existing structures and reduces the record keeping responsibilities. This chapter also presented the responses to the comments received to the proposed rule. Based on the comments received the final rule lowers the size threshold of liquid bulk containers from 793 gallons to 500 gallons. Finally, this chapter provided a comparison of the cost and benefits from the final and proposed rule.

3.0 Baseline Compliance Profile of the Regulated Community

This chapter establishes a baseline regulatory compliance profile of facilities affected by the final pesticide containment rule, which specifies standards for both new and existing containment structures. The first two sections of this chapter discuss the development of a baseline regulatory compliance profile, including the number of facilities expected to install new containment structures or to retrofit existing containment structures for both agricultural pesticide refillers (i.e., agrichemical dealers) (Section 3.1) and agricultural commercial applicators (Section 3.2). Section 3.3 presents an economic profile of agricultural pesticide refillers and agricultural commercial applicators.

The regulated community affected by the pesticide containment regulations are facilities that use one or more stationary bulk agricultural pesticide containers, mobile bulk agricultural pesticide containers that remain in one location for at least 30 consecutive days, and containment pads for agricultural pesticide dispensing areas. Affected facilities include farm supply and agrichemical dealers, commercial aerial and ground applicators not associated with a dealership, and other farm sector industries. These agricultural businesses sell pesticides to the end user and/or apply pesticides as a service.

Several factors influence U.S. agricultural businesses' use of bulk pesticide storage for particular pesticide products. Demand for a particular pesticide is among the most critical factors determining whether a specific pesticide is stored in bulk quantities. Without sufficient demand, agrichemical dealers would not find it economically feasible to store a pesticide in bulk quantities. The size of the overall regional or national market area for a pesticide is also a determining factor, since special transportation equipment is needed to ship bulk quantities of pesticides (Bradley, 1991). Therefore, most bulk pesticide storage at the dealer level is associated with pesticides for crops that are extensively grown within the area served by the dealership, as well as on a broader regional and/or national scale.

The price of a pesticide may also influence which products are likely to be stored in bulk. Dealers are not generally willing to assume the liability of storing large volumes of concentrated pesticide (Lewis, 1991). Currently, EPA's Bulk Pesticides Enforcement Policy July, 1977 (41 FR 55932) allows dealers to refill containers designed and constructed to accommodate volumes exceeding 55 gallons. The feasibility of bulk storage at the dealer level depends, however, on the purchase of large quantities of pesticides by end users. In many cases, dealers also require customers to accept custom application services provided by the dealer. An alternative involves a dealer that has a licensed repackaging agreement with the pesticide manufacturer to permit dispensing of the product into containers designed with a capacity of 55 gallons or less. Industry representatives, trying to promote the trend toward using refillable containers, have increased the use of "toll" repackaging agreements to facilitate use of 15 and 30 gallon refillable containers.[7] The safeguards specified in the Bulk Pesticides Enforcement Policy are incorporated in the final container regulations through the requirements regarding registrant and refilling establishment

[7] EPA policy allows manufacturers to enter into agreements with dealers for the repackaging of pesticide products. There are two types of repackaging: bulk and contract/toll. Toll repackaging involves the use of containers less than 56 gallons liquid or 100 pounds dry capacity.

repackaging responsibilities. The Bulk Pesticides Enforcement Policy will be rescinded after the regulations are final.

Bulk storage of pesticides is closely correlated with specific major crops. Based on information from state agencies and pesticide manufacturers, most bulk pesticide storage is associated with the production of corn, soybeans, wheat, rice, and cotton. Other crops include peanuts and apple and pear orchards (Lewis, 1991; Bradley, 1991; Musselman, 1991; Kirby, 1991; Broadbent, 1991). Regional production patterns of these crops are also reflected in the use of bulk storage for pesticides.

Pesticides stored in bulk are usually those applied at relatively high rates per acre, typically greater than 1 gallon per acre (Musselman, 1991). Pesticides typically applied at low rates per acre do not generate sufficient demand for dealers to store them in bulk quantities (Fulton, 1991; Gingery, 1991); examples are pesticides for minor crops, pesticides for major crops that are grown only to a limited extent in a given area, pesticides that are not popular with the farmers in the service area, and pesticides targeting pests that are seldom of economic concern.

Herbicides, which account for nearly one-half of total agricultural pesticide use (EPA, 2002), are more frequently stored in bulk containers at the dealer level than are other types of pesticides (Fulton, 1991). Corn herbicides, in particular, are the main pesticide stored in liquid bulk containers by dealers, according to state agricultural agency representatives and various pesticide manufacturers (Musselman, 1991; Lewis, 1991; Bradley, 1991). Several contacts indicated that bulk storage of agricultural pesticides is common primarily in the Midwestern Corn Belt states, many of which have existing regulations governing the bulk storage of pesticides. However, according to industry representatives, use of bulk storage is increasing, and some companies are beginning to offer bulk quantities in states that have no experience in containment of large pesticide tanks, particularly in the southern United States.

The majority of bulk pesticide storage facilities affected by this rule are classified in the farm supplies industry under one North American Industry Classification System (NAICS) code, 422910–Farm Supplies Wholesalers (SIC code 5190). NAICS 422910 includes both farm supply dealers and fertilizer dealers (frequently referred to as agrichemical facilities or businesses), as well as other establishments engaged in the distribution of animal feeds, fertilizers, agricultural chemicals, pesticides, seeds, and other farm supplies, except grains (U.S. Department of Commerce, 2002). Agricultural (aerial and ground) commercial applicators are also affected by the rule. A majority of these industries are classified under NAICS 115112–Soil Preparation, Planting, and Cultivating. A number of agricultural services, such as cultivation, pollination, detasseling of corn, hoeing, and pruning, are included under this NAICS code. The following sections provide an overview of the potential number of affected agricultural pesticide refilling and commercial applicator facilities under the rule.

This economic analysis considers alternative definitions of small entities or businesses potentially affected by the containment regulations by disaggregating SBA-defined small businesses into three size categories: small-small (SS), medium-small (MS), and large-small (LS) businesses. EPA proposed alternative definitions of small businesses for some industry sectors in the 1999 Supplemental Notice on Standards for Pesticide Containers and Containment (EPA, 1999). EPA is concerned that using an overly broad definition of small business in the

economic analysis of the containment regulations may result in significant economic impacts on smaller entities that will be camouflaged when combined with information about potential impacts on facilities that meet the SBA size standard for small business but are not typical of a small business in that industry sector.

Table 3.1 presents a summary of the industries likely to be affected by the final pesticide containment standards, highlighting industries that are included in the cost analysis. The majority of affected businesses are agrichemical facilities that serve as refilling establishments (agricultural pesticide refillers) and agricultural (aerial and ground) commercial applicators. Agricultural commercial applicators and other business types comprise about one-third of the number of affected establishments under the rule. Two of the industry sectors considered in the 1999 supplemental notice were pesticide agrichemical dealers and independent commercial applicators. These regulated entities correspond with agricultural pesticide refillers and commercial applicators, respectively, in this economic analysis (EA).

Table 3.1. Industries Regulated by EPA's Containment Regulations

<table>
<tr><th>Affected Industries</th><th>Included in EA (Y/N)</th><th colspan="4">Notes</th></tr>
<tr><td rowspan="6">Agricultural pesticide refillers
(NAICS 422910, Farm Supplies Wholesalers)
Facilities with bulk pesticide storage only.</td><td rowspan="6">Y</td><td colspan="4">All agricultural pesticide refillers. [a] Outdoor and indoor facilities that store liquid and/or dry bulk pesticides, requiring both secondary containment units and containment pads. Includes non-bulk facilities that handle or dispense bulk pesticides, requiring a containment pad. The EA focuses on stationary storage units. Mobile storage units are assumed not to be affected by the rule.</td></tr>
<tr><td colspan="2">SBA Definitions [b]</td><td colspan="2">EPA Alternative Definitions</td></tr>
<tr><td rowspan="3">Small</td><td rowspan="3">100 or fewer employees</td><td>Small-Small</td><td>1 to 9 employees</td></tr>
<tr><td>Medium-Small</td><td>10 to 49 employees</td></tr>
<tr><td>Large-Small</td><td>50 to 100 employees</td></tr>
<tr><td>Large</td><td>101 or more employees</td><td>Large</td><td>101 or more employees</td></tr>
</table>

Table 3.1. Industries Regulated by EPA's Containment Regulations (Continued)

Agricultural commercial applicators (NAICS 115112 Soil Preparation, Planting, and Cultivating) Facilities with bulk pesticide storage only.	Y	All aerial applicators; large ground applicators.[a] Outdoor facilities that store liquid bulk pesticides, requiring both secondary containment units and containment pads. The EA assumes that all independent applicators store bulk pesticides outdoors only, and that they do not store dry bulk pesticides. Non-bulk facilities that handle/dispense bulk pesticides are not examined separately in the economic analysis.			
		SBA Definitions[b]		*EPA Alternative Definitions*	
		Small	Maximum revenues of $6.0 million	Small-Small	1 plane plus $93,750 in sales
				Medium-Small	2 to 4 planes plus $375,000 in sales
				Large-Small	5 or more planes plus $750,000 in sales
		Large	Revenues greater than $6.0 million	Large	Revenues greater than $6.0 million
Custom blenders	N	It is assumed that most of these facilities are captured within estimates of either agricultural pesticide refillers and/or agricultural commercial applicators. No data are available on the few independent facilities that may be affected by the rule.			
Seed treatment facilities	N				
Forestry businesses	N	Most forestry businesses are assumed not to be affected by the rule, based on a review of pesticide storage practices. No data are available on the few facilities that may be potentially affected by the rule.			
Farm sites	N	Not covered by scope of rule.			

[a] Facilities without secondary containment units and containment pads will be affected by the standards for new containment structures; facilities that have secondary containment units and containment pads and are not in compliance with the critical performance-based standards will be affected by requirements for existing containment structures.
[b] The SBA definition is based on the primary NAICS code or codes that best represent(s) the regulated entity.

Several other types of agricultural businesses may have bulk and non-bulk pesticide storage facilities requiring containment structures that are not covered in this EA: independent custom blenders and seed treatment facilities, forestry businesses, and farm sites.[8] Custom blenders are typically identified either as agricultural pesticide refillers or, more rarely, as commercial applicators (Eckermann, 1991; Owens, 1991; Licht, 1991; Faulconer, 1991).

Similarly, seed treatment businesses may be affiliated with dealers or are considered dealers under state regulations. Since the majority of these businesses are likely to be included in the number of agricultural pesticide refillers and independent applicators, these businesses are not considered separately in the cost analysis. Although independent businesses will be affected by the containment regulations, data on these facilities are not available. Furthermore, the number of facilities is likely to be small based on information obtained from state agricultural agency staff and other industry experts.

[8] A more detailed discussion of the rationale for excluding these businesses from the cost analysis is provided in EPA (1993a).

Businesses involved in commercial timber production are among the end users of pesticide products that may store pesticides on-site. Nevertheless, based on information obtained from forestry business representatives, the U.S. Forest Service and state-level forestry agents, forestry-related businesses are not included in the scope of the new containment regulations. None of the large commercial timberland businesses that we contacted store pesticides in stationary bulk containers (Crooker, 1991; Gomersall, 1991; Stilwell, 1991), and some businesses claimed not to store any pesticides at their timberland facilities (Borem, 1991; Striley, 1991). Businesses that provide forest maintenance services are also unlikely to have permanent bulk storage facilities for pesticides (Striley, 1991). Furthermore, timberland businesses commonly contract out pesticide application services (Borem, 1991; Gomersall, 1991; Stilwell, 1991; Striley, 1991). Many large commercial timberland businesses, as well as state and federal forest service agencies, have specific operating procedures and practices that set standards for pesticides use and storage. These guidelines typically meet or exceed state requirements (Crooker, 1991; Parker, 1991; Stilwell, 1991; Striley, 1991). Although some forestry businesses may be affected by the regulations, data are not available to include them in the economic analysis.

Finally, farm sites may also use bulk storage and permanent mixing and loading facilities. Use of bulk storage and permanent mixing and loading facilities on farms varies considerably among states and among regions. Information from most state experts indicates that few farms store pesticides in bulk quantities, as defined by EPA's containment regulations (Coldman, 1991; Fulton, 1991; Vest, 1991). Current disincentives for on-farm bulk storage include the expense of permanent facilities and the increased handling requirements (Owens, 1991). However, bulk farm storage may be common in some states (Donaldson, 1991; Faulconer, 1991; Owens, 1991). When on-farm bulk storage is used, a large farm may store more of a chemical than a small dealership (Faulconer, 1991). In the western states, agricultural pesticide refillers loan out mobile pesticide storage units to farmers who purchase bulk quantities of chemicals, to allow farmers to store chemicals in the field prior to use (Donaldson, 1991). A few of the largest growers may own their own bulk storage tanks for similar purposes.

Farms with bulk pesticide storage are not included in this economic analysis because EPA did not include farms under the scope of the rule. Farms engage only occasionally in bulk pesticide activities, and there is limited evidence that contamination originating from farm mixer/loader pads is widespread, as compared to environmental contamination from refilling establishments. Moreover, data are not available to estimate the number of farms with bulk pesticide storage. A representative of the Illinois Department of Agriculture asserted that there are three farms in Illinois with storage of over 300 gallons of pesticides, while the Kansas Department of Agriculture estimates that six farms statewide store pesticides in bulk containers (EPA, 2005). A contact from the Colorado Department of Agriculture said there are very few pesticide containers over 500 gallons on farms in Colorado (EPA, 2005). Comments submitted to EPA by some state regulatory agencies suggest that there are less than six farmer locations with bulk containers greater than 500 gallons in Minnesota. While these estimates suggest that few farms have bulk storage of pesticides, other state contacts suggested that the practice is more common. A state-level contact estimated that less than 1 percent of all farms in Iowa (about 800), and 3 percent of all farms in the United States (about 62,000 farms), may store pesticides in bulk tanks (Owens, 1991). A representative of the Washington State Department of Agriculture estimated that 15% of farms have pesticide tanks larger than 500 gallons, although it is possible that this figure

includes fertilizer tanks, as well (EPA, 2005). These estimates are much higher than an earlier estimate of 1,500 farms, based on 50 percent of all corn, soybean, and cotton farms that have sufficient acreage to use more than 3,000 liters of herbicides in a year. At this time, there is insufficient information to justify including farms in the rule.

3.1 Compliance Profile of Agricultural Pesticide Refillers

Agricultural pesticide refilling facilities affected by the pesticide containment regulations include sites with bulk pesticide storage (liquid and dry) and dealers without bulk storage that conduct pesticide dispensing activities requiring a containment pad. We derived an estimate of the number of these regulated facilities from previous estimates of all agricultural pesticide refillers in the United States, adjusted for available state industry statistics and methodological assumptions. Specifically, we provide estimates of the number of affected facilities for the following categories of agricultural pesticide refillers: (1) the total number of agricultural pesticide refillers that qualify as refilling establishments; (2) a subcategory of all refilling establishments, representing the number of agricultural pesticide refillers with bulk pesticide tanks; (3) agricultural pesticide refillers with bulk tanks but without secondary containment that will need to install new structures; and (4) agricultural pesticide refillers with bulk tanks that have substandard secondary containment and will need to retrofit existing structures. These estimates are described in the following sections and presented in Tables G.1 through G.4 of Appendix G.

3.1.1 Total Number of Agricultural Pesticide Refillers

Data on agricultural pesticide refillers with bulk pesticide storage subject to the pesticide containment regulations (with bulk tank capacity greater than 500 gallons or 4,000 pounds) are not available for the nation as a whole. Instead, a state- and regional-based approach was used to develop an estimate of the current status of bulk pesticide storage facilities. This approach was deemed necessary given the significant differences in the use of bulk pesticide storage nationwide, as well as differences in bulk pesticide storage regulations among states. Although pesticides are used on most crops in most parts of the country, few pesticides are used in such quantities in a given area to warrant the storage of bulk quantities at the dealer level. Where available, data are supplemented by information obtained from state-level personnel in key agricultural states.[9]

The number of agricultural pesticide refillers is based on published national and state-level data. Published data sources include American Business Information and the U.S. Department of Commerce, both of which provide a national overview of the number of farm supply and fertilizer dealerships by state. Since these aggregate estimates tend to overestimate the actual number of facilities, given the inclusion of businesses that are not actually involved in selling agricultural chemicals, the number of refilling establishments is estimated from available state information.[10] These data are then adjusted to focus only on those facilities that store pesticides in bulk quantities, with capacity subject to the regulations (i.e., greater than 500 gallons or 4,000

[9] According to CropLife America, there are increasing numbers of bulk facilities being built in states without bulk containment structures. However, no data are currently available to substantiate these claims.

[10] As shown in Table G.1, similarities exist between the published data and various state-level estimates of the number of agricultural pesticide refilling (agrichemical) facilities, although there are significant differences in some states.

pounds), and/or those that have pesticide dispensing areas. NAICS- and/or SIC-based data are used when more detailed state estimates are not available or where available information is contradictory or inconsistent.

As shown in Table 3.2, an estimated 16,795 refilling facilities could potentially sell agricultural chemicals (though not necessarily store them in bulk containers). This estimate is from the proposed EPA containment rule RIA, which is based on 1992 data. By using these data, EPA assumes that the number of facilities in the industry did not change since 1992. The information on commercial applicators presented in Table 3.2 is discussed in Section 3.2. The number of agricultural refillers is further adjusted, as described below, to reflect the number of facilities that store bulk quantities of pesticides on-site and/or that engage in handling/dispensing activities that require containment structures. Approximately 5,040 bulk facilities (includes 175 facilities with dry containers) located at agricultural pesticide refilling establishments are affected, because the bulk tank containment regulations only affect tanks greater than 500 gallons or 4,000 pounds in capacity.

Table 3.2. Regulatory Compliance Baseline, Agricultural Pesticide Refillers and Commercial (Aerial and Ground) Applicators

Type of Applicator	Total	Facilities with Bulk Storage [b]	Secondary Containment [c]		Containment Pad [c]	
			With	Without	With	Without
Agricultural Pesticide Refillers						
Total Agrichemical Dealers	16,795 [a]					
Retail Liquid bulk (>500 gal)		5,040 [b]	4,548 [c]	491	4,206 [d]	834
Retail Dry bulk (>4,409 lbs)		175 [e]	147 [f]	28	--	--
Non-bulk		561 [g]	--	--	--	561
Commercial Applicators						
Total Commercial Applicators	3,000 [h]	210 [i]	189 [j]	21	175 [j]	35
Aerial applicators	2,000	160	144	16	134	26
Ground applicators	1,000	50	45	5	42	8

Totals may not add due to rounding.

[a] See Table G.1.

[b] See Table G.2.

[c] Assumes that 100% of facilities in regulated states and that 40% of facilities in non-regulated states have containment structures in place. Remaining facilities are assumed to not have containment structures and will need to install both secondary containment structures and pads. This estimate is derived from the proposed EPA containment rule RIA. (See Table G.2.)

[d] Assumes that 100% of facilities in regulated states and 25% of facilities in non-regulated states have containment structures in place. Remaining facilities are assumed to not have containment pads and will need to install pads. This estimate is derived from the proposed containment rule RIA. (See Table G.2.)

[e] These facilities are part of the 5,040 bulk liquid facilities because it is assumed that dry bulk containers are jointly located at facilities that also have liquid bulk storage. This forecast is taken from the proposed EPA containment rule RIA, based on a review of state agency and industry information.

[f] Assumes that 90% (158 facilities) of dry bulk facilities are located in eight states (IN, IL, IA, MI, MN, ND, OH, SD). Based on a review of containment regulations in these states, weighted against the number of liquid bulk facilities in these states, 140 facilities (89%) are in compliance. Among the facilities in the remaining states, it is assumed that 40% (seven facilities) are in compliance, given lack of better information. Assumes all dry bulk containment facilities are jointly located at facilities that also have liquid bulk storage.

[g] Difference between the number of bulk dealers with bulk liquid containment less than 55 gallons and the number of facilities with containment greater than 500 gallons. (See Table G.2.)

[h] American Business Information reported an estimated 3,936 independent applicator facilities in 1992. For this analysis, it is assumed that 2,000 are aerial applicators (National Agricultural Aviation Association, 2001). An estimated 1,000 ground applicator facilities are assumed. The remaining facilities are not reviewed because it is assumed that they do not handle/dispense bulk pesticides.

[i] Based on industry and state-level data, it is assumed that an overall estimate of 8 percent of all aerial applicators (160 facilities) have bulk pesticide storage containers greater than 500 gallons or 4,409 pounds. About 5 percent of the estimated number of independent ground applicators (50 facilities) are assumed to have bulk storage facilities for agricultural pesticides in containers greater than 500 gallons or 4,409 pounds.

[j] Based on information for agricultural pesticide refillers (see Table G.2), 90% of all agrichemical bulk facilities are in compliance with the secondary containment standards and 83% of facilities are expected to be in compliance with the containment pad standards. Assumes that the estimated number of facilities without secondary containment units also do not have pads (i.e., 10 aerial applicator facilities and three ground applicator facilities will require containment pads only).

The following sections discuss the assumptions used to estimate the number of facilities that require secondary containment of bulk pesticide storage (liquid and dry), as well as the number of bulk and non-bulk facilities that require containment pads for dispensing activities.

3.1.2 Number of Agricultural Pesticide Refillers with Bulk Pesticide Storage

The number of agrichemical refilling facilities with stationary bulk storage of liquid or dry pesticides is estimated in the following sections (see Table 3.2).

Facilities with stationary bulk liquid pesticide storage. No published data are available to document the number of agricultural pesticide dealers with bulk liquid pesticide storage facilities by state. National estimates of 3,500 (Myrick, 1991a) and 3,000 bulk storage facilities (Gilding, 1991) have been reported. The difference between the estimates highlights the need to develop an independent estimate. To derive such an estimate, information and data from several states were examined, most of which have existing pesticide containment regulations: Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Montana, North Carolina, North Dakota, Ohio, South Dakota, Vermont, West Virginia, and Wisconsin. State agency personnel in these states provided information on the percentage of dealers with bulk storage, which was used to estimate the number of bulk dealers (or visa versa). All dealers were assumed to handle pesticide containers greater than 55 gallons.

Information obtained from these states was also used to derive an estimate of the percentage of dealers that have bulk storage facilities in states where data are not available. The average of all available state percentages of dealers that have bulk storage is about 40 percent. This figure is based on information on the Corn Belt states, where the use of bulk storage for agricultural pesticides is greater than in other parts of the country.[11] Additionally, these states define "bulk" storage as stationary containers (i.e., not a minibulk or other container designed to be transported) with a capacity of greater than 55 gallons. This definition is similar to that used in most of the states with existing pesticide containment regulations.

Data from state agricultural agency representatives outside the Corn Belt region indicate a much lower use of bulk storage of agricultural pesticides. Contacts in Maine, Mississippi, and West Virginia indicated that less than 10 percent of their pesticide dealers have bulk storage facilities; contacts in Vermont and North Carolina provided information indicating that less than 20 percent of their agricultural pesticide dealers have bulk storage facilities. Accordingly, it was not deemed reasonable to assume that the same percentage of bulk facilities in other agricultural regions is the same as the percentage in the Corn Belt states. Therefore, a regional approach was adopted to estimate the number of dealers of bulk pesticides. The economic analysis assumes that 50 percent of pesticide dealers in the Corn Belt region and 25 percent of all dealers in the other major agricultural states store pesticides in bulk containers. In 25 states that have less agricultural production (see Table G.2 for the full listing), it is assumed that about 10 percent of refillers store pesticides in bulk containers. Based on this methodology, the total number of U.S.

[11] The Corn Belt states are Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio and South Dakota. Major agricultural states not included in the Corn Belt states are California, Colorado, Kansas, Kentucky, Louisiana, Montana, New York, North Dakota, Pennsylvania, Washington and Wisconsin. The remaining 25 states are those with less agricultural production.

pesticide dealers with bulk storage of liquid pesticides in containers greater than 55 gallons is estimated at about 5,601 (see Table G.2).

Facilities that store pesticides in containers with a capacity greater than 500 gallons are affected by the regulations. Since most stationary bulk storage containers hold at least 1,000 gallons, it is assumed that 90 percent of all bulk facilities store pesticides in undivided quantities of greater than 500 gallons. This percentage is based on data provided by various state agency personnel and on professional judgment. Based on these calculations, an estimated 5,040 agrichemical facilities with bulk liquid storage tanks handle pesticide containers greater than 500 gallons (Table 3.2 and Table G.2) and are subject to the containment regulations.

Facilities with stationary bulk dry pesticide storage. Bulk storage of dry pesticide formulations is a fairly recent innovation compared to liquid bulk pesticide storage. Only a few pesticide companies market their dry pesticide formulations in bulk; these products are typically corn herbicides. The fixed tanks used to store dry bulk pesticides are similar to those used for liquid pesticides and may hold up to 90,000 pounds of product. The tanks are loaded pneumatically, involving a filtration system to avoid contamination from dust. Unlike liquid pesticide tanks, tanks for dry bulk pesticides have no hydraulic pressure to force a dry product out of the tank should a leak occur. When spills do occur, dry bulk pesticides are more easily contained than liquid pesticides.

Manufacturers of dry bulk pesticides do not require storage tanks to be installed within a diked area, although the same manufacturers require secondary containment for liquid bulk pesticides. The dry bulk tanks are typically installed on concrete pads, which may be several feet thick and are designed to support the weight of the tank and its contents. While not specifically designed to prevent runoff or run on, the pads are often curbed or sloped toward the center. About 50 percent of existing tanks have been installed within existing secondary containment structures designed for and shared by liquid bulk pesticide tanks. Manufacturers typically require an operational pad in front of dry bulk tanks for loading and unloading (Helmer, 1991).

Dry bulk pesticide systems were developed to fill a market niche that underwent rapid expansion in the early 1990s. One industry contact estimated a 33 percent increase in the number of dry bulk tanks between 1991 and 1992, while another indicated that an increase of more than 90 percent could have occurred within the same period (Helmer, 1991, Keffer, 1991). To estimate the number of facilities with dry bulk, the proposed EPA containment rule regulatory impact analysis (RIA) tried to account for a potential increase in the number of facilities with dry bulk. Discussions with State agencies suggest that the growth in dry bulk storage did not continue. As a result, this economic analysis assumes the same number of dry bulk facilities as in the proposed EPA containment rule RIA, amounting to a total of 175 tank facilities (Table 3.2). These facilities are concentrated in three states—Illinois, Indiana, and Iowa. Dry bulk facilities are also located in Michigan, Minnesota, North Dakota, Ohio, and South Dakota. These eight states are assumed to account for most (90 percent) of the dry bulk pesticide storage facilities (158 facilities), with the remaining facilities located in all other states (17 facilities). All facilities that store bulk quantities of dry pesticide are assumed to be located in states that regulate pesticide containment structures. Only medium-small, large-small, and large facilities are expected to be affected by requirements for dry pesticide storage. All dry bulk containers are assumed to be jointly located at facilities that also have liquid bulk storage.

Facilities with mobile bulk pesticide storage. The pesticide containment regulations are assumed to affect agricultural refilling businesses that store pesticides in a mobile container with a capacity greater than 500 gallons (liquid) or 4,409 pounds (dry) for more than 30 consecutive days at one location (i.e., primarily agrichemical facilities with stationary bulk pesticide storage). Other facilities will also be affected by the containment regulations, including agrichemical facilities that conduct non-bulk refilling activities that require containment. This analysis does not estimate costs for mobile containers since it is assumed that facilities using mobile containers will not be affected by the regulations.

The following sections discuss the assumptions used to estimate the number of facilities that require secondary containment of bulk pesticide storage (liquid and dry), as well as the number of bulk and non-bulk facilities that require containment pads for dispensing activities.

3.1.3 Agricultural Pesticide Refillers Requiring Installation of New Containment Structures

The final containment rule outlines standards for both secondary containment units and containment pads. Agrichemical refilling facilities that will be affected by standards for new containment structures include facilities with outdoor and indoor bulk storage (liquid and dry). Facilities with non-bulk storage of liquid pesticides are also included if the dealers engage in activities (i.e., dispensing or refilling) that require a pesticide containment pad. Tables located in Appendix G provide estimates of the number of bulk pesticide containment facilities without existing containment structures that are affected by regulations governing new containment structures (see Table G.3). The baseline number of agricultural pesticide refillers is from the proposed EPA containment rule RIA.

No data are available to assess the compliance status of bulk pesticide storage facilities. However, many structures are located in states that already regulate bulk pesticide storage. To evaluate the applicability of these state standards to the federal requirements, EPA conducted a comprehensive review of existing regulations in 19 states: Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, North Dakota, Ohio, South Dakota, Vermont, Washington, West Virginia, and Wisconsin (see Appendix C). Each EPA requirement was checked against individual state regulations to determine the percentage of structures in those states that would also be in compliance with requirements if the final rule.

This economic analysis assumes that all facilities in states that regulate bulk pesticide storage have secondary containment and containment pads, and that all facilities in regulated states are in compliance with containment rule requirements. In the unregulated states, we assume that 40 percent of bulk facilities have secondary containment (see Table G.2). Using these assumptions, we estimated the number of facilities that will either be required to install new containment structures or to retrofit existing containment structures to comply with the standards for existing and new structures.

Facilities with bulk liquid pesticide storage that require installation of new structures. An estimated 5,040 facilities handle, dispense, and/or store bulk quantities of liquid pesticides subject to containment regulations (Table 3.2). Currently, 19 states have regulations that specify

standards for secondary containment of bulk pesticides. An estimated 4,220 facilities (84 percent of refilling facilities with bulk storage) are located in states that regulate bulk pesticide storage subject to containment regulations (Table G.2 in Appendix G). Of the remaining facilities, it is assumed that approximately 40 percent of all facilities in unregulated states have secondary containment.[12] Therefore, an estimated 491 (60 percent of 820) bulk liquid storage facilities do not have secondary containment and will need to install both new secondary containment units and pads (Table G.2).

Excluding the estimated 28 facilities that also require structures for dry bulk pesticide containment (see next section), 463 facilities will need containment structures for bulk liquid storage only. For the purposes of this analysis, it is assumed that 70 percent of these facilities are outdoors and that 30 percent of facilities are indoors.[13] Therefore, 324 facilities (70 percent of 463 facilities) would require installation of outdoor containment structures, and 139 facilities (30 percent of 463 facilities) would require installation of indoor containment structures (see Table G.3).

Containment pads are also subject to the standards. An estimated 4,206 facilities, or approximately 83 percent of all facilities with bulk liquid storage, currently have containment pads for pesticide dispensing areas (see Table G.2). This total assumes that all facilities that handle pesticide containers greater than 500 gallons in states with containment regulations would comply with state requirements. However, not all these states regulate containment pads according to EPA standards. Currently, 16 of the 19 regulated states have standards for containment pads (excluding Kansas, Louisiana, and North Dakota) that appear to be consistent with EPA standards (see Appendix D). Kansas, Louisiana, and North Dakota do not have standards for containment pads that are consistent with EPA standards and are assumed to have compliance similar to the unregulated states.

All bulk pesticide storage facilities in the 16 regulated states are assumed to have containment pads. An assumed measure of 25 percent of facilities in states without existing regulations (and in Kansas, Louisiana, and North Dakota) are assumed to have containment pads. There are a total of 834 facilities in unregulated states (including Kansas, Louisiana, and North Dakota) that do not have containment pads and would need to construct new pads (see Table G.2). Most of these facilities (491 facilities) are expected to construct pads in addition to secondary containment structures under the containment regulations (included in previous estimates). The remaining 343 facilities (834 facilities less 491 facilities) will only require installation of new containment pads. Approximately 240 (70 percent) facilities will require outdoor pads, whereas 103 (30 percent) facilities are expected to require indoor containment pads (see Table G.3).

Facilities with bulk dry pesticide storage that require installation of new structures. This analysis assumes that all dry bulk containers are jointly located at facilities that also have liquid bulk storage. An estimated 175 agrichemical facilities (among the 5,040 liquid bulk dealers) handle, dispense, or store bulk quantities of dry pesticides (Table 3.2). Of these, 158 facilities (90 percent) are assumed to be located in eight states (Indiana, Illinois, Iowa, Minnesota, North

[12] Data from one state with containment regulations indicated that two facilities did not have secondary containment units and pads. These two facilities were added to the total number of facilities not in compliance with containment regulations.

[13] Estimate from the proposed EPA containment rule RIA based on information obtained from industry contacts.

Dakota, Ohio and South Dakota), all of which have containment regulations of varying degrees of stringency. There are 17 facilities in states without regulations (175 - 158). A majority of these facilities will need new structures.

Weighted against the number of liquid bulk containment structures in the states with regulations equivalent to EPA's (Table G.2)[14] it is assumed that 140 (approximately 90 percent) of the 158 facilities in those states have secondary containment units and containment pads that meet federal requirements.[15] For the 17 facilities with dry bulk storage in states without regulations, it is assumed, based on professional judgment, that 40 percent (7 facilities) are in compliance and 10 will need new structures. Therefore, an estimated 147 facilities have existing dry bulk storage structures and an estimated 28 facilities (175 - 147) will need to construct both new secondary containment units and containment pads to meet federal requirements (see Table G.3).

Facilities with non-bulk pesticide activities that require installation of new structures. Some agricultural pesticide refillers who conduct activities that do not involve bulk quantities of pesticides are also subject to the requirement for a pesticide containment pad. For example, a dealer involved in refilling pesticide containers from non-bulk containers must have a containment pad. No information is available regarding the number of businesses that conduct such activities. An estimated 5 percent of all agricultural pesticide refillers that do not have bulk pesticide storage facilities carry out activities that are subject to the containment pad requirements (Howard, 1991). For this analysis, all the remaining facilities (i.e., those with containers between 55 gallons and 500 gallons) are assumed to conduct pesticide refilling/dispensing activities and require a containment pad. It is assumed that none of these 561 facilities (5,601 minus 5,040 bulk facilities) currently have containment pads and all will need to construct new pads to be in compliance (see Table G.3).

3.1.4 Agricultural Pesticide Refillers Requiring Retrofitting of Existing Containment Structures

This section estimates the number of agricultural pesticide refilling facilities with liquid and dry bulk pesticide storage that will need to retrofit existing containment structures to comply with the final standards. Agricultural pesticide refilling facilities will be affected by standards for existing secondary containment structures protecting bulk liquid and dry containers, and for existing containment pads. Table G.4 summarizes the number of bulk pesticide containment facilities with existing containment structures that are affected by the final rule. The baseline number of agricultural pesticide refillers is from the proposed EPA containment rule RIA.

No data are available to assess the compliance status of facilities with existing containment structures or bulk storage containers. Many structures, however, are located in states that regulate pesticide containment. To estimate the rate of compliance, this analysis first considers the number of facilities with secondary containment and/or containment pads that potentially comply with EPA requirements, based on a comprehensive EPA review of regulations in 19 states (Appendix C) and broad-based assumptions derived from state regulatory agencies and industry information. The results of the comparison between state and federal standards were

[14] This analysis assumes that all dry bulk containers are jointly located at facilities that also have liquid bulk storage.
[15] Although these dry bulk facilities are assumed to be located in regulated states, not all state requirements are adequate to meet federal standards.

used to derive the percentage compliance for facilities in states that regulate bulk pesticide storage.[16] It was assumed that one-half of the structures in unregulated states are in compliance, because of existing pesticide manufacturer requirements, regulations already being implemented (e.g., effluent regulations under the EPA Office of Water), or the presumed use of basic good management practices.

3.1.4.1 Facilities with Bulk Liquid Pesticides That Require Retrofitting of Existing Structures

Existing secondary containment units. Facilities with bulk liquid pesticides may need to retrofit existing secondary containment structures and containment pads. Approximately 328 facilities in states without regulations are estimated to require retrofitting of existing secondary containment for bulk liquid pesticides (i.e., 4,548 total facilities less the 4,220 facilities with secondary containment units in regulated states – Table G.2). In addition, although most facilities in regulated states are in compliance with the critical standards, it is estimated that 4 percent will have to retrofit due to some discrepancy between the critical standards and state regulations (see Table G.4). Subsequent estimates of the number of affected facilities are based on a review of state regulations in conjunction with information from industry experts.

Agricultural pesticide refilling facilities with stationary liquid bulk storage in existing containment structures are assumed to incur compliance costs to: (1) seal floor drains or discharge outlets, (2) seal all cracks, and (3) conduct monthly inspection and recordkeeping. Based on a review of state regulations and other industry information, approximately 96 percent of secondary containment structures in states with existing regulations are assumed in compliance with the standards to seal floor drains and discharge outlets and will not incur retrofitting costs. About 50 percent of structures in states without regulations are assumed in compliance. Accordingly, a total of 333 structures [(4,220*0.04)+(328*0.50)] are not in compliance and must retrofit by sealing floor drains or discharge outlets. The number of facilities that will need to seal all cracks are estimated based on the assumption in the proposed rule RIA that all structures in states with regulations and 10 percent of structures in states without regulations are in compliance. Therefore, an estimated 295 structures (328*0.9) will incur costs to seal cracks. (See Table G.4.)

Weekly or monthly inspections of containment structures are currently required in 11 of the 19 states with containment regulations.[17] Weighted against the number of liquid bulk facilities in these regulated states, approximately 67 percent of all facilities in states with regulations are in compliance. An estimated 30 percent of the 328 facilities in states without regulations are assumed to have secondary containment units that are in compliance with monthly inspection requirements. Accordingly, 1,602 facilities [(4,220*0.33)+(328*0.70)] will incur monthly inspection and recordkeeping costs.

---

[16] Where necessary, this economic analysis utilizes percentage compliance estimates derived in the proposed rule RIA. These estimates were based on a review of compliance in several states, most of which regulate bulk pesticide containment structures: Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, Montana, North Carolina, North Dakota, Ohio, South Dakota, Vermont, West Virginia, and Wisconsin.

[17] Of the state regulatory review conducted by EPA (Appendix C), eight states do not meet EPA's requirements for monthly inspections and recordkeeping: three states (Kansas, North Dakota, and Ohio) do not specify an inspection requirement; five states (Louisiana, Indiana, Missouri, South Dakota, and Wisconsin) have inspection requirements that do not match the federal requirement.

Existing pads. An estimated 205 facilities with pads are assumed not in compliance and will need to retrofit to meet EPA standards (from Table G.2, 4,206 total facilities less the 4,001 facilities with containment pads in states with regulations). Requirements for existing containment pads include the pad's ability to contain 750 gallons (such as by adding a curb and/or a sump), a way to clean up spills (such as a pump), floor drains sealed, cracks repaired, and monthly inspection and recordkeeping.

The number of facilities that will need to seal existing drains is estimated assuming that 96 percent of containment pads in states with regulations and 50 percent of the 205 facilities in non-regulated states comply with EPA standards. Thus, 263 pads [(4,001*0.04)+(205*0.50)] are out of compliance and must seal existing drains. Pads not in compliance are assumed to lack a capacity of 750 gallons, either by use of a curb or sump. Sloping is not required for existing facilities, and flat pads can be in compliance with or without a sump if they have a means of containing 750 gallons (such as with a curb) and the ability to pump out spills and leaks. The number of facilities that will require a sump or curb is estimated assuming that 94 percent of containment pads in states with regulations and 50 percent of pads in states without regulations have a capacity of at least 750 gallons. As a result, approximately 343 facilities are considered out of compliance and will need to retrofit pads [(4,001*0.06)+(205*0.50)]. Retrofit estimates are based on the cost of a curb or berm. The cost for a portable pump and hose for removing collected liquid materials and/or rainfall is considered part of the cost to retrofit secondary containment structures. It is assumed that all facilities either already have a portable pump or will purchase one.

It is assumed that all existing pads in regulated states are in compliance because of state requirements to seal all cracks, gaps, and seams, but that only 10 percent of pads in non-regulated states are in compliance. An estimated 185 pads (205*0.90) are not in compliance and will incur costs to seal all cracks, gaps, and seams. In states with regulations, approximately 67 percent of all facilities are assumed in compliance with monthly inspection and recordkeeping requirements. In states without regulations, 30 percent of all facilities are assumed in compliance. A total of 1,445 facilities with existing pads [(4,001*0.33)+(205*0.70)] are estimated to incur inspection and recordkeeping costs.

3.1.4.2 Facilities with Bulk Dry Pesticides That Require Retrofitting of Existing Structures

Some facilities with bulk dry pesticides may need to retrofit existing secondary containment structures. An estimated 147 facilities have existing structures for secondary containment of bulk dry pesticides (Section 3.1.3).

For this analysis, the number of dry bulk facilities needing retrofit is calculated from data for liquid bulk facilities (see Table G.4), which show that 90 percent of all facilities are in compliance with the standards for secondary containment units. This compliance percentage is applied toward the number of facilities with existing dry bulk containment units, indicating that approximately 15 facilities (147*0.10) are not in compliance and will need to retrofit to comply with EPA standards for repairing cracks, gaps, and seams.

Approximately 70 facilities will incur inspection and recordkeeping costs. Of the 158 facilities assumed in compliance in the eight states used for the analysis, it is assumed that 67 percent (106) are in compliance with recordkeeping and inspection. Thus, the remaining 52, plus the 17 in the remaining states (175 - 158), will incur inspection and recordkeeping costs.

3.2 Compliance Profile of Agricultural Commercial Applicators

The compliance profile of agricultural applicators in the United States that will be affected by the pesticide containment regulations centers on aerial and ground applicators with bulk storage facilities requiring containment structures. Estimates of the number of agricultural commercial applicators that will be affected by EPA's containment standards are compiled from available information, supplemented by derived data on agricultural pesticide refillers. Affected facilities must either install new containment structures or retrofit existing structures.

Pesticide applicators that handle pesticides in bulk quantities and apply agricultural pesticides for compensation (other than trading of personal services between agricultural producers) will be affected by the final requirements. The analysis includes independent aerial and ground applicators, but excludes commercial applicators associated with agrichemical dealers (businesses that would be included in a compliance overview of agricultural pesticide refillers). It is assumed that independent applicators have outdoor facilities only and do not engage in bulk storage and dispensing activities for dry bulk pesticides. All independent applicator facilities are assumed to be located in states that regulate bulk pesticide storage and operational pads for pesticide dispensing areas.

3.2.1 Total Number of Agricultural Commercial Applicators

Source data on the total number of commercial applicators that are not associated with agrichemical dealers are limited compared to the information available on agricultural pesticide refillers. In 1993, the total number of licensed agricultural (plant) commercial applicators was estimated at 95,445 (EPA, 1993b). However, data on the number of businesses (rather than individual applicators) are not readily available, and estimates that span different business categories vary. For example, the number of individual aerial applicators is estimated at 13,031 (Myrick, 1991a). The number of businesses is much smaller.

In 1992, American Business Information (ABI) reported 1,361 businesses in the "Spraying, Horticultural" category and 1,816 businesses in the "Weed Control Service" category, representing a total of 3,177 businesses. This figure does not include aerial applicators, but instead includes non-agricultural businesses such as lawn care services and right-of-way maintenance businesses. In 1993, there were 3,936 establishments in the crop services industry (U.S. Department of Commerce, 1993), which includes all aerial and independent ground applicators, custom blenders, and other crop services such as cultivation, detasseling of corn, pruning, or harvesting. The total number of "aerial applicators (service)" was reported at 2,225 (ABI, 1992). For this analysis, an estimate of 2,000 aerial application businesses is used, based on an estimate of 2,000 to 2,100 businesses through a spokesperson for the National Agricultural Aviation Association (Collins, 1991). These businesses have a total fleet of about 6,000 planes plus an unknown number of backup planes (Collins, 1991).

According to the Small Business Administration (SBA, 2002), agricultural commercial applicators are likely to be associated with NAICS Code 115112 (Soil Preparation, Planting, and Cultivation). Data are not available to separate out the affected establishments by those that practice insect, weed, or disease control of crops through ground application of pesticides; cultivation services; detasseling of corn; hoeing; pruning; harvesting; cotton ginning; etc. As a rough approximation, this analysis assumes that a maximum of 1,000 establishments under NAICS Code 115112 are independent ground applicators. The remaining number of businesses provide other crop services and are not expected to be directly affected by the rule.

An estimated 35 percent to 40 percent of all agricultural pesticides are applied aerially (Fertig, 1991). Aerial applicators represent the largest group of agricultural commercial applicators, and are less likely to be associated with agrichemical dealers or other businesses than are ground applicators. Aerial applicators are typically independent businesses either based at municipal airports or private, often on-farm, airports. General information regarding the location (municipal or private airports) of aerial application businesses nationwide is not available, although information is available for some states. In Iowa, for example, it is estimated that about 50 percent of aerial applicators are based at municipal airports (Eckermann, 1991).

In addition to applying pesticides, aerial application businesses may apply fertilizers and sow seeds, and may also seed or apply chemicals to non-agricultural lands such as rights-of-way and forests. Non-pesticide and non-agricultural aspects of aerial application account for about 5 percent of all aerial application businesses. However, only about 1 percent of all aerial application businesses specialize exclusively in these areas (Collins, 1991).

Aerial applicators may operate in one of two ways: (1) businesses may both supply and apply the selected pesticide for the farmer; or (2) businesses may provide only the service of applying a pesticide provided to them by the farmer. Of all aerial applicators, those that sell both the chemicals and the application services to the farmer are the most likely to have bulk storage facilities (Faulconer, 1991; Hardcastle, 1991). These businesses may also provide consulting services to farmers; some may even have entomologists on their staff (Hardcastle, 1991). Applicators may also sell products at retail to farmers, especially those businesses that have bulk storage for pesticides. In some states, these businesses are legally considered to be agrichemical dealers (Hardcastle, 1991), and some of these facilities may be included in the data on agricultural pesticide refillers presented previously. Aerial applicators that only apply chemicals supplied by the farmer are unlikely to have bulk storage facilities.[18]

Most agricultural commercial applicators that provide ground application services are affiliated with agrichemical dealers, either as employees or under contract. One state contact estimated that 80 percent of all commercial applicators are affiliated with dealers, while the remaining 20 percent are with independent (non-dealer) businesses (Myrick, 1991a). Of that 20 percent, 70

[18] Aerial applicators based at county or municipal airports may face unique challenges in establishing secondary containment structures or containment pads since they do not own the property, and the property may be subject to Federal Aviation Administration regulations or local regulations (Eckermann, 1991). Until more information is obtained regarding whether aerial applicators working out of municipal airports will experience difficulty in obtaining the needed permission to construct secondary containment and/or containment pad structures, or until the feasibility of using non-permanent (portable) containment pads is determined, this analysis assumes that aerial applicators will be able to comply with the proposed regulations.

percent are estimated to be independent aerial applicators. The remaining 30 percent represent one estimate of the number of independent ground applicators. Agricultural commercial applicators with bulk storage may also sell the bulk product directly to the end user (i.e., refill minibulks), as a sideline to direct application of the product to the customers' fields (Rowdowca, 1991). These businesses are often regulated as pesticide dealers under state laws and are assumed to have been included as part of the overview of agricultural pesticide refillers.

3.2.2 Number of Agricultural Commercial Applicators With Bulk Pesticide Storage

There are an estimated 2,000 aerial applicators and 1,000 independent ground applicator businesses nationwide. Only a subsection of these facilities handle, dispense, and/or store bulk quantities of pesticides. Estimates of the number of aerial and ground applicator facilities are provided in Table 3.2, contrasting the total number of aerial and ground commercial applicators and the estimated number of facilities that maintain bulk pesticide quantities.

Aerial applicators. Aerial applicators with bulk storage typically have one or two pesticide storage tanks, each with a capacity of up to 2,000 gallons (Hardcastle, 1991). Some facilities may have three tanks, and some may have tanks as large as 10,000 gallons (Breedlove, 1991). Data from Iowa indicate that up to 5 percent of aerial applicators in the state may have bulk storage (Eckermann, 1991). Few aerial applicators in southern Texas have bulk storage, while up to 10 percent of aerial applicators in northern Texas may have bulk storage (Hardcastle, 1991). Mississippi, which requires registration of bulk tanks used by aerial applicators, reported that 24 out of 152 aerial applicators (16 percent) have bulk storage tanks with capacity greater than 800 gallons (Fulton, 1991). Based on these data, combined with professional judgment, it is assumed that an overall estimated 8 percent of all aerial applicators, or 160 facilities, have bulk pesticide storage containers.

Ground applicators. For this analysis, it is assumed that about 5 percent of the estimated total number of independent ground applicators (50 facilities) have bulk storage facilities for agricultural pesticides that are applied with ground rigs. The estimated 50 facilities with bulk storage are profiled as loading pesticides into and unloading pesticides from bulk tanks, filling and cleaning bulk storage equipment, and loading equipment at the facility or refilling minibulk containers for use as shuttles to transport chemicals to the field. The remaining 950 independent ground applicators that do not have bulk storage facilities likely mix and load chemicals in the fields where they are working, rather than at a fixed location (Myrick, 1991a).

3.2.3 Independent Applicators Requiring Installation of New Containment Structures

Regulations covering new structures specify standards for both secondary containment units and containment pads. Table G.3 shows the number of independent applicators with bulk pesticide storage that do not currently have containment structures in place and will be affected by EPA's regulation of new containment structures.

An estimated 160 aerial facilities and 50 ground applicator facilities handle, dispense, and/or store bulk quantities of liquid pesticide (Table 3.2). Data are not available to profile the current secondary containment status of bulk storage facilities at aerial and ground applicator facilities, and it is not known how many applicators with bulk pesticide storage containers are in states that regulate secondary containment. It is therefore assumed that all independent applicators are in

states with regulations. Assuming that the use of bulk storage at independent applicator facilities follows a similar regional pattern of use as that for agrichemical dealer facilities, 90 percent of all facilities are estimated to be in compliance with secondary containment standards and 83 percent of all facilities are estimated to be in compliance with containment pad standards.

Using these percentage compliance estimates, it is assumed that 144 aerial facilities and 45 ground applicator facilities are in compliance with the final standards for secondary containment. Accordingly, an estimated 16 aerial applicators and five ground applicators with bulk storage are not in compliance and will require installation of both new secondary containment units and pads. Similarly, an estimated 134 aerial facilities and 42 ground applicator facilities are in compliance with EPA containment pad requirements (this assumes that the estimated number of facilities without secondary containment units also do not have pads.). The number of facilities that are not in compliance and that will need to install new pads is estimated at 10 aerial applicator facilities (144 needing both units and pads minus 134 already having pads) and three ground applicator facilities (45 needing both units and pads minus 42 already having pads). (See Tables 3.2 and G.3.)

3.2.4 Agricultural Commercial Applicators Requiring Retrofitting of Existing Containment Structures

Regulations covering existing structures specify standards for secondary containment units and containment pads. Table G.4 shows the number of bulk pesticide containment facilities that currently have containment structures in place and will need to retrofit existing structures to comply with the critical standards.

Facilities with existing secondary containment are estimated at 144 aerial applicators and 45 ground applicator facilities (Table 3.2). Facilities with existing containment pads are estimated at 134 aerial applicators and 42 ground applicator facilities. Not all of these existing structures are in compliance with the standards for existing secondary containment units and pads. Subsequent estimates of the number of facilities that are not in compliance and are affected by EPA's regulations are derived based on information on state regulations and information from industry experts. It is assumed that all agricultural commercial applicators are located in states that regulate pesticide containment.

Facilities with bulk liquid pesticides that require retrofitting of existing structures. The 189 aerial and ground facilities with existing containment structures may need retrofitting (Table 3.2). Assuming that 96 percent of secondary containment structures in regulated states are in compliance with standards for existing structures, the number of facilities not in compliance that will incur costs to seal floor drains or discharge outlets is estimated to be eight (189*0.04). Because all regulated states have a requirement to seal all cracks, and because all independent applicator structures are assumed to be located in regulated states, no structure is affected by this requirement as a result of the rule.

Weekly or monthly inspections of containment structures are currently required within 11 of the 19 states with containment regulations. Weighted against the number of liquid bulk facilities in these regulated states, approximately 67 percent of all facilities in regulated states are in compliance. Since all facilities are assumed to be located in regulated states, 62 facilities (189*0.33) will incur monthly inspection and recordkeeping costs (See Table G.4).

An estimated 175 applicator (aerial and ground) facilities with existing structures may be required retrofit existing containment pads (Table 3.2). Requirements for existing containment pads include: ensure 750-gallon capacity, have a berm, seal floor drain, repair cracks, and conduct monthly inspection and recordkeeping. It is assumed that all applicators are in regulated states, but not all states require pad capacity equal to or greater than 750 gallons. Assuming that 96 percent of containment pads in regulated states meet EPA standard for sealing drains, 7 facilities (175*0.04) must seal existing drains. Assuming that 94 percent of containment pads in regulated states already have a berm or are sloped to a sump, 11 facilities (175*0.06) must add a berm. All facilities are assumed to repair cracks that are likely to develop in the concrete over time. A total of 57 existing pads (175*0.33) are estimated to require inspection and recordkeeping, assuming that 67 percent of all facilities are in states that require weekly or monthly inspections (See Table G.4).

3.3 Baseline Economic Profile of the Regulated Community

This section presents an economic and financial overview of the regulated community, consisting of SBA-defined business sizes (large and small) and EPA-defined alternative small business sizes (large-small, medium-small, and small-small)[19] for agricultural pesticide refillers (based on NAICS 422910 – Farm Supplies and Wholesale Sector) and commercial applicators (based on NAICS 115112 – Soil Preparation, Planting, and Cultivating).

The economic analysis of EPA's containment regulations is based on the projected impacts on representative bulk pesticide storage and dispensing facilities. Economic profiles of these facilities were developed to represent typical operational and revenue characteristics of affected entities. Examples of operational characteristics include the number of employees and the number and size of bulk pesticide containers.

The number of representative facilities included in this analysis is intended to capture the broad range of facility sizes (based on SBA and EPA alternative definitions) and facility types (primarily agricultural pesticide refillers and commercial applicators). Only those facilities with bulk pesticide storage containers and/or pesticide dispensing areas were considered.

The following subsections describe the two main categories of representative facilities in the analysis: agricultural pesticide refillers and agricultural aerial applicators. The specific methods and assumptions used to develop the models are also discussed. A third type of representative facility representing independent ground applicators is not considered. Only about 50 facilities may be affected by the regulation, and since sufficient information is not available to characterize these entities, we assume that the ground applicators have the same financial

[19] This economic analysis considers an alternative to SBA's definition of small entities or businesses potentially affected by containment regulations by disaggregating SBA-defined small businesses into three size categories: small-small (SS), medium-small (MS), and large-small (LS) businesses. EPA proposed alternative definitions of small businesses for some industry sectors in the 1999 supplemental notice on Standards for Pesticide Containers and Containment. EPA is concerned that using an overly broad definition of small business in the economic analysis of the containment regulations may result in significant economic impacts on smaller entities that will be camouflaged when combined with information about potential impacts on those facilities that meet the SBA size standard for small business but are not typical of a small business in that industry sector.

characteristics as aerial applicators. Summary exhibits of representative characteristics are provided in Tables 3.3, 3.4, and 3.5.

Table 3.3. Representative Agricultural Pesticide Refilling Facilities, Bulk Pesticide Storage Containers and Pesticide Dispensing Areas [a]

Characteristics	Representative Facility Size				Industry Total
	Small-Small	Medium-Small	Large-Small	Large	
Operating Characteristics					
Number of industry establishments [b]	13,996	2,395	251	153	16,795
Number of industry establishments with bulk pesticides liquid storage and pesticide dispensing areas [c]	2,241	2,395	251	153	5,040
Number and size of bulk pesticides liquid storage containers [d]	1-1,500 gal	3-2,000 gal	2-4,000 gal 3-3,000 gal 2-1,500 gal	2-4,000 gal 3-3,000 gal 2-1,500 gal	13,400
Number of industry establishments with bulk pesticides dry storage [e]	0	105	35	35	175
Number and size of bulk pesticides dry storage containers [f]	0	1-90,000 lb	1-90,000 lb	1-90,000 lb	--
Number of industry establishments with pesticide dispensing areas associated with smaller (non-bulk) containers [g]	561	--	--	--	561
Number of employees [h] Range in number of employees	3 1 to 9	19 10 to 49	71 50 to 100	448 101 or more	173,858 --
Revenue Characteristics					
Average Revenue (2005$, millions) [i]	$0.8	$6.7	$22.7	$191.6	$62,319

[a] The majority of agricultural pesticide refilling facilities with bulk storage and dispensing areas are classified under NAICS Code 422910, Farm Supplies Wholesalers. A Dun and Bradstreet (D&B) sample data set was extracted for businesses identified by NAICS Code 422910 to develop representative characteristics of agricultural pesticide refillers based on SBA-defined small and large businesses and EPA alternative definitions for small businesses (small-small, medium-small, and large-small). Characteristics of the D&B sample data set were applied to the estimated total number of agricultural pesticide refillers used in the analysis (16,795).

[b] For this analysis, small-small firms have been defined as those having 1 to 9 employees, medium-small firms 10 to 49 employees, large-small firms 50 to 100 employees, and large firms 101 or more employees. According to analysis of the D&B sample data set for firms with NAICS Code 422910, about 83.3 percent had 1 to 9 employees, 14.3 percent had 10 to 49 employees, 1.5 percent had 50 to 100 employees, with the remaining 0.9 percent of establishments having more than 100 employees. The 16,795 U.S. agricultural pesticide refillers estimated earlier in this analysis are distributed in roughly the same proportions to small-small, medium-small, large-small, and large representative firms, respectively.

[c] The number of agricultural pesticide refilling facilities having bulk storage of pesticides was estimated earlier in this analysis at 5,040. It is assumed that all Large, Large-Small, and Medium-Small facilities have bulk storage, with the remainder assigned to the Small-Small facility category.

[d] The number and size of bulk liquid containers by size of facility is based on information provided by agricultural experts across the country, with more weight given to that information representative of the Midwest. While the total number of bulk liquid containers in the industry is not known, a rough estimate of 12,060 polyethylene and 1,340 steel containers for a total of 13,400 bulk containers is made for purposes of analysis. This number does not add to the number based on representative facility (12,254).

[e] About 130 dry bulk tanks were known to exist in the spring of 1991, with an expected 33 percent increase in such tanks within a year. It is assumed that 175 tanks will be in place and potentially affected by the proposed regulations. We assumed distribution as follows: medium-small (60%), large-small (20%), and large (20%).

[f] Manufacturer information indicates most dry bulk tanks purchased by agrichemical facilities have a capacity of 90,000 pounds. We assumed one tank per medium-small and large-small facility, and one tank per large facility.

Table 3.3. Representative Agricultural Pesticide Refilling Facilities, Bulk Pesticide Storage Containers and Pesticide Dispensing Areas [a] (Continued)

[g] 561 small-small agricultural pesticide refillers are estimated to carry out activities that will subject them to the containment pad requirements. See Table G.1.

[h] According to the analysis of the D&B sample data set for firms with NAICS Code 422910, small-small representative facilities are profiled as having three employees, medium-small facilities 19 employees, large-small facilities 71 employees, and large facilities 448 employees. The total number of employees in the agricultural pesticide refiller industry was estimated to be 173,858.

[i] We estimated revenue levels for each representative facility based on sales data associated with businesses profiled in the D&B sample data set for firms with NAICS Code 422910.

Table 3.4. Economic Profile of Agricultural Pesticide Refillers by Entity Size

Entity Size Category	Definition	D&B Sample Data Set for NAICS 422910						Agricultural Pesticide Refillers	
		Total Companies	Percent of Total Companies	Total Revenue for All Companies (million)	Percent of Total Revenue	Average Revenue per Company (million)	Average Number of Employees per Company	Total Entities [a]	Total Revenue for All Entities (million) [b]
SBA-Defined Sizes									
Large	101 or more employees	114	0.9%	$21,843	47.1%	$191.6	448	153	$29,322
Small	100 or fewer employees	12,397	99.1%	$24,580	52.9%	$2.0	6	16,642	$32,997
Total		12,511	100.0%	$46,423	100.0%	$3.7	10	16,795 [c]	$62,319
EPA Alternative Small Business Sizes [d]									
Large-Small	50 to 100 employees	187	1.5%	$4,246	9.2%	$22.7	71	251	$5,700
Medium-Small	10 to 49 employees	1,784	14.3%	$12,001	25.9%	$6.7	19	2,395	$16,110
Small-Small	1 to 9 employees	10,426	83.3%	$8,333	18.0%	$0.8	3	13,996	$11,187
Total		**12,397**	**99.1%**	**$24,580**	**52.9%**	**$2.0**	**6**	**16,642**	**$32,997**

[a] The percentage of total companies in the D&B sample data set was applied to the estimated number of agricultural pesticide refillers used in the analysis.
[b] The average revenue of agricultural pesticide refillers for each entity size category was multiplied by the total number of entities for the given size category.
[c] EPA estimate based on state estimates where available; otherwise, SIC 5191.02 + 5191.14 from the American Business Information Lists of 9 Million Businesses, 1990. The same total number is estimated as presented in the 1999 Supplemental Notice on Standards for Pesticide Containers and Containment (EPA, 1999b).
[d] EPA discussed alternative definitions of small businesses for some industry sectors in the 1999 Supplemental Notice on Standards for Pesticide Containers and Containment (EPA, 1999b). EPA is concerned that using an overly broad definition of small business in the economic analysis of the container regulations may result in significant economic impacts on smaller entities that will be camouflaged when combined with information about potential impacts on those facilities that meet the SBA size standard for small business but are not typical of a small business in that industry sector.

Table 3.5. Representative Agricultural Aerial Application Facilities, Bulk Pesticide Storage Containers, and Pesticide Dispensing Areas [a]

Characteristics	Representative Facility Size			Industry Total
	Small-Small	Medium-Small	Large-Small	
Operating Characteristics				
Number of industry establishments [b]	780	1,120	100	2,000
Number with bulk storage [c]	15	110	35	160
Number and size of bulk tanks [d]	1-1,500	2-2,000	1-6,000 2-2,000	Unknown
Number of planes [e]	1	2-4	5 or more	6,000+
Number of acres treated [f]	25,000	100,000	200,000	
Revenue Characteristics				
Application price/acre ($) [g]	3.75	3.75	3.75	--
Premium on chemical/acre ($) [h]	0.27	0.27	0.27	--
Revenues (2005$) [i]	100,580	401,250	802,500	--

[a] Similar characteristics are assumed for ground applicators.
[b] The analysis assumes that no agricultural aerial applicators meet the SBA definition for a large business (>$6.0 million in revenue). The total number of industry establishments and the number of EPA alternative small business sizes is based on information obtained from the National Agricultural Aviation Association (NAAA) for small-small facilities with one plane, and expert opinion and professional judgment to estimate the number of medium-small and large-small facilities (NAAA, 2001).
[c] Based on information provided by several sources, it is estimated that no more than 8 percent of aerial applicators nationwide have bulk pesticide storage. No data exist on whether those estimated 8 percent of industry facilities (160) are small-small, medium-small, large-small, or large facilities. For this analysis, it is assumed that about 2 percent (15) of the small-small facilities have bulk storage, 10 percent (110) of the medium-small facilities have bulk storage, and 35 percent (35) of the large-small facilities have bulk storage.
[d] Preliminary estimates, based on limited information.
[e] Based on information provided by the NAAA that the total fleet size of all aerial applicators is about 6,000 plus an unknown number of backup planes (NAAA, 2001).
[f] Assumes that each plane flies a minimum of 250 hours per year with an average of 100 acres treated per hour.
[g] Based on information from aerial applicators in several states (North Dakota, Nebraska, Kansas, and Texas), an average application price charged per acre is about $3.50.
[h] Aerial applicators try to achieve some margin per acre on the chemicals they apply. This margin varies by region, and estimates obtained for this analysis ranged from $0.10 per acre to $0.50 per acre. This analysis assumes that a margin on chemicals of $0.25 per acre is attained. Some farmers provide their own chemicals or will work through a dealer to provide the chemicals to the aerial applicator. Thus, not all aerial applicators earn a premium on chemicals for all acres treated. However, this analysis is relevant to those applicators that store pesticides in bulk quantities, and such applicators are likely to provide their own chemicals.
[i] Revenues = (Number of acres treated)(Application price per acre)+(Number of acres treated)(Premium on chemical per acre).

3.3.1 Economic Profile of Agricultural Pesticide Refillers

Agricultural pesticide refillers repackage and supply the majority of pesticides to farmers and other agricultural end users. Agricultural pesticide refillers are generally represented under NAICS 422910 (Farm Supplies and Wholesale Sector), which consists of "establishments primarily engaged in wholesaling farm supplies, such as animal feeds, fertilizers, agricultural chemicals, pesticides, plant seeds and plant bulbs" (U.S. Department of Commerce, 1997).

To establish a regulatory compliance baseline, we solicited expert opinion to profile operational characteristics of typical large, large-small, medium-small, and small-small agricultural pesticide

refillers with bulk pesticide storage facilities. The total volume of pesticides stored by facilities is both a function of the number of bulk tanks and the size of the individual tanks. Agricultural pesticide refillers vary widely with respect to the number and size of bulk storage containers, as well as the total volume of pesticides stored. For example, a facility with only one bulk pesticide storage tank could have a very small 500-gallon tank or a very large 12,000-gallon tank. Such cases are exceptions, however, with the majority of tanks used having capacities of 1,000 to 4,000 gallons.

Table 3.3 summarizes the characteristics of the representative agricultural pesticide refilling facilities, organized by four sizes: large, large-small, medium-small, and small-small. Each type of facility incorporates different assumptions regarding the bulk storage capacity, number of employees, and financial profile of the representative entity. Small-small refillers are assumed to have one liquid pesticide bulk storage tank with a capacity of 1,500 gallons. Facilities with three 2,000 gallon tanks are considered medium-small facilities (total capacity of 6,000 gallons). Large-small and large refillers are assumed to have seven bulk liquid tanks (two 4,000 gallon, three 3,000 gallon, and two 1,500 gallon) for a total capacity of 20,000 gallons.[20]

In addition to facilities with liquid bulk containers, representative facilities with dry bulk tanks are also characterized (see Table 3.3). As discussed in the previous section, this analysis estimates that approximately 175 dry bulk tanks, most with a capacity of 90,000 pounds, are considered potentially affected by the proposed regulations. While most dealers have only one dry bulk tank, a few may have two. For this analysis, it is assumed that 105 medium-small facilities, 35 large-small facilities, and 35 large facilities each have a single dry bulk tank.[21]

We extracted revenue and employee data from the Dun & Bradstreet (D&B) database for all establishments with NAICS 422910 designations to generate the agricultural pesticide refillers economic profile. We assume that financial information extracted from D&B for the NAICS 422910 market sector is representative of the agricultural pesticide refiller entity subject to the containment regulations. As a result, 24,360 records were pulled from the D&B database, with 21,599 establishments having sufficient financial data to be included in the analysis. These data were consolidated by Domestic Ultimate DUNS number in order to aggregate facilities by parent company designation, resulting in a total of 12,511 unique companies identified[22]. It appears that D&B inconsistently reports revenue and employee information at the Domestic Ultimate DUNS level. In few instances where discrepancies arise, we used the maximum values for the

[20] For this analysis, Small-Small firms have been defined as those having 1 to 9 employees, Medium-Small firms 10 to 49 employees, Large-Small firms 50 to 100 employees, and Large firms 101 or more employees (see Table 3.4). According to analysis of the D&B sample data set for firms with NAICS Code 422910, about 83.3 percent had 1 to 9 employees, 14.3 percent had 10 to 49 employees, 1.5 percent had 50 to 100 employees, with the remaining 0.9 percent of establishments having greater than 100 employees. The 16,795 U.S. agricultural pesticide refillers estimated earlier in this analysis are distributed in roughly the same proportions to Small-Small, Medium-Small, Large-Small, and Large representative firms, respectively.

[21] About 130 dry bulk tanks were known to exist in the spring of 1991, and it is expected that this number is now not larger than 175. Therefore, it is assumed that 175 tanks will be in place and potentially affected by the final regulations. The 175 tanks are distributed as follows: medium-small (60%), large-small (20%) and large (20%).

[22] The DUNS Number is a unique nine-digit identification sequence, which provides unique identifiers of single business entities, while linking corporate family structures together. D&B links the DUNS Numbers of parents, subsidiaries, headquarters and branches on more than 90 million corporate family members around the world.

D&B data fields "Employees Total" and "Sales Volume (US$)" associated with each Ultimate DUNS number.

The D&B sample data set was broken down into small and large entity sizes according to the SBA small business definition for NAICS 422910 (i.e., SBA defines a small business for NAICS 422910 as having 100 employees or fewer). As illustrated in Table 3.4, 99 percent of the 12,511 unique parent companies identified were considered small by SBA definition. Based on EPA alternative small business definitions presented in Table 3.1, approximately 83 percent were small-small, 14 percent were medium-small, and 2 percent were large-small (see Table 3.4).

It was determined that no single NAICS code was unique to agrichemical dealers or agricultural pesticide refillers. Therefore the economic profile for the sample of 12,511 companies was applied to the total universe of 16,795 agricultural pesticide refillers, as illustrated in Table 3.3. The estimated number of agricultural pesticide refillers (16,795 companies) is based on the information presented in the 1999 Supplemental Notice for Pesticide Containers and Containment Structures (EPA, 1999). This estimate is considered to be a reasonable estimate for the current total number of entities potentially affected by the containment regulations.

3.3.2 Economic Profile of Agricultural Commercial Applicators

Crop services affected by containment structure regulations include aerial application, independent ground application of pesticides, chemigation, and custom blending. Companies that provide these services and are not associated with an agrichemical dealership are likely to be classified under NAICS Code 115112 – Soil Preparation, Planting, and Cultivation. Commercial applicators are often hired by farmers to apply pesticides to a variety of crops. The two primary types of agricultural commercial applicators are aerial applicators and ground applicators. These operations require the use and refilling of bulk pesticide containers and smaller minibulk containers used for pesticide application from airplanes and/or trucks.

The industry profile used here is based on information collected from 1,968 aerial pesticide application businesses in a 1998 survey conducted by the National Agricultural Aviation Association (NAAA, 2001). No comparable source of data was identified to characterize and profile the financial conditions for ground applicators. Given that the SBA definition of a small business for commercial applicators (based on NAICS Code 115112) is no more than $6 million in annual revenues, all commercial applicators considered in this analysis are assumed to be SBA-defined small businesses based on analysis of the NAAA data. Because no equivalent information is available for ground applicators, we assume that the ground applicators have the same financial characteristics as aerial applicators (see Table 3.5). This analysis estimates that 2,000 of the "soil preparation, planting, and cultivation" establishments (included in NAICS Code 115112) are aerial applicators and that 1,000 are independent ground applicators.

Insufficient data exist to develop representative facilities for the agricultural commercial application industry. Instead, we consulted state-level experts to profile these businesses according to the number of planes per business, the number of acres treated per business, and the price charged per acre by the aerial applicator. Table 3.5 summarizes these characteristics of the aerial application industry by facility size. The representative small-small aerial applicator is defined as having one plane and one bulk container of 1,500 gallons, and treating approximately

25,000 acres annually. The representative medium-small facility is defined as having two to four planes and two 2,000 gallon bulk pesticide storage containers, and treating approximately 100,000 acres per year. The representative large-small aerial applicator has five or more planes (some are known to have as many as 10 planes) and three bulk containers with a total capacity of 10,000 gallons, and treating at least 200,000 acres annually. Again, no large commercial applicators are considered in this analysis.

Although some commercial applicators may be affiliated with pesticide registrants or agricultural pesticide refillers, most commercial applicator operations are independently owned. No definitive information is available to determine which or how many agricultural commercial applicator operations are part of larger companies otherwise subject to regulations. We assume the 2,000 aerial and 1,000 ground applicators considered in this analysis to be independently owned and operated and directly impacted by containment requirements.

The resulting breakdown of the number of affected entities and financial characteristics for representative facilities by EPA alternative small business definition is presented in Table 3.5. Because insufficient data are available for ground applicators, the entity size breakdown and financial characteristics for aerial applicators were applied to the estimated 1,000 ground applicators affected by containment regulations.

In summary, this chapter presented the economic profile of the agricultural refillers and commercial applicators, and provided the estimates of the number of facilities not in compliance with the final containment regulations (i.e., will have to install new containment units and/or pads, or will have to retrofit existing containment units and/or pads). This information will be used together with the information on the costs of compliance described in the next chapter (Chapter 4) to estimate the impacts of compliance with the final containment regulations (described in Chapter 4 and Chapter 5).

4.0 Facility Impact Analysis

The preceding chapter (Chapter 3) described the compliance of bulk pesticide containment facilities with the final containment regulations, presenting estimates of the number of facilities that will need to install new containment units and pads and those facilities that will need to retrofit existing containment units and pads for compliance with the final regulations. We use this information, along with the information on unit costs presented in this chapter, to estimate the impacts of compliance with the final regulations for the average entity in each of the regulated industries.

This chapter presents the estimated facility-level cost to construct new containment units and pads (Section 4.1), as well as to retrofit existing containment structures under the final regulations (Section 4.2). Costs are estimated for small-small, medium-small, large-small, and large representative facilities of agricultural pesticide refillers (agrichemical dealerships) and independent, for-hire commercial (aerial and ground) applicators.[23] The general approach used to develop the costs of compliance, per facility and in aggregate, involved the following steps:

(1) Compile unit costs for secondary containment units and containment pads;
(2) Apply unit costs to the expected equipment and materials required to bring both new and existing containment structures into compliance;
(3) Calculate facility-level compliance costs (non-discounted) and then discount and annualize those costs; and [24]
(4) Calculate aggregate costs and assess economic impacts by representative facility and for affected industries.

Appendix A presents a more detailed discussion of the discounting and annualization methods we apply in this analysis. It is important to note, however, that this analysis considers two discount/interest rate scenarios: a 3 percent scenario and a 7 percent scenario.[25]

The final containment regulations affect bulk pesticide storage facilities that have existing containment structures, as well as facilities that will require new containment structures to comply with the rule. For bulk storage facilities without existing secondary containment units and/or containments pads, the cost to construct *new* containment structures is estimated. These estimates cover the cost to construct secondary containment units for stationary bulk pesticide containers of liquid and/or dry pesticides. The estimates also include the cost to construct containment pads for areas where pesticides are dispensed from and into bulk containers, as well

[23] Note that this is a departure from the facility size categories used in the proposed containment regulations RIA, where facility sizes were categorized as small, medium, and large. We transfer cost assumptions from the proposed RIA as follows: small cost assumptions are applied to small-small facilities; medium cost assumptions are applied to medium-small facilities; and large cost assumptions are applied to both large-small and large facilities.
[24] The average number and size of containers in representative facilities have an impact on the construction cost for containment units because they affect the total storage area. This is the only way in which the number of containers affects the cost.
[25] Where applicable, all discounted and annualized costs are presented using both a 3 percent and 7 percent discount rate scenario in their calculation. The cost tables will be presented for both discount rates, but the text will only describe the estimated costs at the 3 percent discount rate.

as for areas where refillable containers are cleaned and/or refilled. Agricultural refillers and applicator businesses with existing containment structures that do not meet the critical standards will incur costs to retrofit or replace *existing* structures in order to comply with the final rule.

Facility-level costs are calculated using unit costs from the 1992 period, developed to estimate costs for the RIA of the proposed rule. To update final industry compliance costs to current year (2005) dollars, we apply a CPI-U "All Items" based adjustment factor to account for general price inflation (U.S. Department of Labor, 2005). The results of the facility impact analysis are then used to evaluate the aggregate industry impacts of the final pesticide containment regulations (see Chapter 5). Appendix H presents the unit costs of compliance with the final regulations.

Many businesses requiring pesticide containment structures under this rule may already have secondary containment units and/or containment pads in place, particularly in states with existing bulk storage regulations. Other affected businesses have no pesticide containment structures. Accordingly, compliance costs per facility will vary greatly, depending on whether containment structures are already in place, and if so, the extent to which such structures will require retrofitting to comply with the final rule.

Equipment and materials required for the construction of necessary secondary containment units and pads are based on information from various published and industry sources, including guidance specifications and manuals, engineering cost studies, industry publications, vendor and manufacturer literature, and information received from industry contacts. Unit costs were compiled from published data sources, including *Means Site Work Cost Data* and *Building Construction Cost Data* (R.S. Means Company, Inc., 1991a, 1991b, 1992), and from estimates provided by equipment manufacturers and vendors.

Where data were not available, we simply transferred cost assumptions from similar unit cost categories. For example, new bulk liquid outdoor storage cost data were not available for small-small, medium-small, and large-small commercial applicators. To fill this cost gap, we assumed that the new bulk liquid outdoor storage cost data associated with small-small, medium-small, and large-small agricultural refillers were representative of costs incurred by commercial applicators and transferred the costs accordingly. All facility-level costs were originally calculated in 1992 dollars, based on the reported unit costs in the proposed containment rule RIA. As stated above, figures are inflated to 2005 dollars to account for general price inflation over the period. All final cost estimates expressed in terms of annualized costs are in 2005 dollars.

We calculated facility-level costs according to total capital, initial, intermittent, and operating and management (O&M) costs for secondary containment units and for containment pads at each representative facility. These costs are combined and converted to an annualized cost by first calculating the present discounted value of the stream of compliance costs associated with the containment regulations for the length of the compliance period. We then annualized the present discounted value for the same compliance period. Once the annualized cost has been calculated for each representative facility, the annualized costs are multiplied by the estimated number of

facilities expected to incur those costs. This procedure results in an aggregate annual cost by industry.

Compliance with the regulations is required 3 years after promulgation of the final rule. Containment structures are projected to have a 20-year life, and this economic analysis computes costs across a 20-year period, although the engineering design, the level of maintenance, and climate factors can result in a longer (or shorter) life. Regulations are assumed to be published in year 1, with construction of new containment structures occurring in years 2 and 3, and with full compliance by the beginning of year 4. All capital (depreciable) or initial (non-depreciable) costs are assumed incurred in year 3; annual (O&M) costs occur each year after the compliance date is reached (year 4 through year 20 in the 20-year period of analysis); and intermittent costs occur every fifth year following full compliance.

4.1 Compliance Costs for New Containment Structures

This section discusses the cost assumptions and unit cost data that are used to compute compliance costs, followed by a presentation of the results of the facility-level cost analysis. Costs of compliance with EPA standards for new containment structures are presented by representative facility for agricultural refillers and for independent (for-hire) commercial applicators, followed by a discussion of aggregate industry costs.

New Secondary Containment Units. For this analysis, a new secondary containment unit consists of an impermeable pad with a wall around its perimeter, within which stationary bulk storage containers are placed. Concrete is assumed to be the primary material currently used to construct secondary containment units, although other compatible materials of equivalent strength and imperviousness would also comply with the rule.[26]

The final containment regulations require that precipitation and pesticide rinsate[27] that fall on secondary containment structures be disposed of properly. Several design options are feasible to manage pesticide rinsate and precipitation within secondary containment units. Containment structures can be built with or without a sump, and with or without a roof. Adding a roof to an outdoor bulk pesticide storage area will reduce the amount of precipitation collected in a

[26] Under EPA's requirements, concrete is listed among other recommended materials from which to construct pesticide containment facilities, including steel, reinforced concrete, or other rigid materials that are liquid-tight. Asphalt and earthen material, however, are prohibited.

[27] "Rinsate" is defined as any liquid containing relatively low concentrations of pesticides (i.e., less than field strength application concentrations) that can accumulate on the surface or in the sump of a containment structure (Kammel et al., 1991). Rinsates attributable to the proposed regulations are:

- Water from cleaning refillable containers
- Water from the wash down of a containment structure
- Precipitation falling on a containment structure.

Rinsate can generally be reused. However, it becomes "waste" if there is no longer an opportunity to use it in an acceptable manner and it is discarded as waste. An incompatible pesticide rinsate mixture may occur when two or more incompatible pesticides are allowed to mix in a rinsate collection area (e.g., a sump). Depending on the pesticide mixture, this incompatible mixture may be disposed at a hazardous waste disposal facility, incinerated at an acceptable facility, or recycled in a rinsate recycling system. These recycled materials will not necessarily become wastes. Not all incompatible rinsates will become hazardous wastes.

secondary containment unit that must be used as make-up water, which may be applied to a field as a pesticide product or discarded as waste.

The regulatory option depicted for this economic analysis includes a sump system (i.e., a pit or reservoir for collecting rinsate/precipitation) and a storage tank to hold accumulated rinsate/precipitation prior to reuse or proper disposal. The design option does not depict roofed outdoor storage within a secondary containment unit, although a roof or other sufficient overhang would prevent the accumulation of significant quantities of precipitation. The Agency is recommending but not requiring a roofed structure.[28] All structures, regardless of design, will require a portable pump and hose to clean up spills. The same pump can be used to remove rinsate/precipitation, as required.

Indoor facilities are assumed to already have concrete floors. Secondary containment of indoor stationary bulk containers is assumed to require thorough cleaning of the existing concrete structure and the addition of a wall for containment. A portable pump and hose are considered essential for cleaning up any spills. The result is a "new" containment structure (i.e., the existing concrete floor by itself is not considered a secondary containment unit in the baseline).

Both flat-bottomed and cone-shaped containers are used for bulk pesticide storage, and we initially analyzed secondary containment for both types of containers. Consistent with the proposed regulations, the previous analysis (the proposed containment rule RIA) estimated costs for flat-bottomed containers assuming at least minimal elevation to allow for observation of leakage from the base area.[29] Flat-bottomed containers have higher capital costs, because of greater displacement volume and the need for a higher wall. Cone-shaped containers have higher O&M costs, because more concrete within the containment area is generally exposed and subject to deterioration. There are no significant differences in overall costs due to the type of container(s) in use at a facility. The number and size of stationary bulk containers to be contained, and whether such containers are indoors or outdoors, will influence the cost of secondary containment at affected facilities.

Contractors' fees associated with the construction of new secondary containment structures are estimated at 30 percent of direct costs for outdoor structures and 25 percent of direct costs for indoor structures. Contingency fees also associated with the construction of new secondary containment structures are estimated at 5 percent of direct costs plus contractor's fees. These have also been added to the overall construction costs.

For this economic analysis, the size of secondary containment areas is based on the storage area and wall heights shown in Table 4.1 for each of the four representative agricultural refilling facilities. The average number and size of containers at each representative facility, specified in Chapter 3, determine the storage area and wall heights presented in Table 4.1. These storage areas allow for a 3-foot clearance between all containers and between containers and the edges of the walled area. The wall height is then sized to allow containment equal to 100 percent (indoor

[28] EPA requires protection from precipitation for dry bulk; however, some facilities achieve this with tarpaulins over sealed tanks. EPA believes that it is not necessary to specify a protection method because it is in a facility's best interest to protect the dry product it has purchased.

[29] The requirement to elevate storage tanks was subsequently deleted from the regulation.

structures) or 110 percent (outdoor structures) of the volume of the largest stationary bulk container plus the volume displaced by the bottom of the container(s); pump(s); other containers within the containment area; and pipes, hoses, and other appurtenances. We transfer these storage area specifications to same-sized (small-small, medium-small, and large-small) commercial applicators.

Table 4.1. Storage Area and Wall Height of Representative Agricultural Refiller Facilities

Representative Agricultural Refiller Facility Size	Storage Area	Wall Height
Small-Small (indoor) Small-Small (outdoor)	12' x 12' 12' x 12'	1.5' - 2' 2'
Medium-Small (indoor) Medium-Small (outdoor)	13' x 33' 13' x 33'	1' 1'
Large-Small (indoor) Large-Small (outdoor)	26' x 40' 26' x 40'	1' 1'
Large (indoor) Large (outdoor)	26' x 40' 26' x 40'	1' 1'

The major cost factor for facilities with bulk pesticide storage is the price of concrete, which is assumed to be the primary construction material for secondary containment units. It is assumed that 6-inch thick, reinforced concrete will be the primary material used for construction of the concrete pad upon which the bulk containers will be stored. Unit costs for concrete are assumed at $5.48 per square foot ($ft^2$) (see Table H.1). Indoor secondary containment units are not expected to incur concrete costs for floors since it is assumed that these containers are all installed over concrete. Wall unit costs range from $9.53/$ft^2$ to $17.82/$ft^2$, depending on the wall height (see Table H.3).

The analysis assumes that all stationary bulk containers, liquid or dry, indoor or outdoor, are already on concrete pads. Dry bulk storage containers must be enclosed within a 6-inch curb or berm extending at least 2 feet beyond the perimeter of the container.[30] Typically, stationary dry bulk pesticide storage containers are installed over concrete pads. To ensure sufficient protection from wind and rain, the facility would have to use either a roof or tarpaulin, but the rule does not specify how that protection is to be achieved. The existing pad must be extended and surrounded by a berm.

Unit costs for concrete are assumed at $5.48/$ft^2$; berm unit costs are estimated at $13.74/ft (consistent with unit costs estimated for berm heights of about 1 foot) (Table H.1). Dry bulk only needs a berm of 6 inches. Reinforcement bars are used to join the existing and new areas of concrete, and are estimated at $3.02/ft (Table H.5, H.12). A portable pump and hose necessary for secondary containment units are estimated to cost $548 (Table H.1). Sump costs for secondary containment units are estimated at $959 for a small-small facility, $1,644 for a medium-small facility, and $3,013 for large-small and large facilities (Table H.1). Costs to new

[30] This requirement in the final rule specifies that dry pesticides be stored on pallets or on a concrete platform in order to protect from wind and rain and to prevent water in or under the pesticide. Costs incurred under the final regulations are based on the requirement of a 6-inch high curb that extends at least 2 feet beyond the perimeter of the container.

facilities are not estimated for stormwater protection, appurtenances easily observed for leaks, lockable valves, attended transfer, and rinsate management, since these costs/activities are assumed to be part of a facility's routine operation and therefore already accounted for in the O&M costs.

EPA is not requiring rinsate tanks, but is recommending that they be part of bulk pesticide containment structures. Nevertheless, rinsate tanks represent an indirect cost of the rule since facilities will have to manage rinsate in any case. New facilities will need to purchase rinsate tanks as part of the package to comply with the rinsate management required by the secondary containment regulations.[31] The rinsate tanks could, according to good management practice, be placed inside the same containment as the pesticide storage. The added cement for the displaced volume of the rinsate tanks as compared to the pesticide tanks is expected to be negligible.

This economic analysis calculates the cost of rinsate tanks for new facilities, but not for existing facilities.[32] To comply with the final rule's criteria for rinsate management, it is assumed that every new facility will have to have a rinsate tank, even facilities with dry bulk storage, unless all their containers are dedicated to single products. All existing agricultural refilling establishments (indoor and outdoor) are likely to have acquired rinsate tanks in order to comply with the 1996 EPA Office of Water effluent guideline regulations, and so should have already incurred costs for tanks (EPA, 1996). The effluent regulations, however, do not necessarily apply to the same sectors of the pesticide industry as the pesticide containment rule. As a conservative measure, rinsate tank costs are added to all new facility structures as part of this economic analysis. Rinsate tank costs are not estimated for existing facilities, since it is assumed that all existing facilities already have tanks in place.

Rinsate storage typically consists of three to six tanks ranging from 100 to 500 gallons each. Most facilities will have two rinsate tanks, which tend to be smaller than the pesticide tanks. Alternatively, many outdoor facilities will use large 3,000 gallon rinsate tanks.[33] A small facility may opt to use 55-gallon drums to store rinsate. The cost of rinsate tanks also varies for outdoor versus indoor containment structures. In the case of outdoor liquid bulk facilities, rinsate tanks also function as precipitation storage, and so tend to be larger. Inside facilities also require tanks, but since they only collect rinsate these tanks may be smaller.

Based on information obtained from a container manufacturer, tanks of cross-linked polyethylene are often cheaper than stainless steel and provide a reasonable option for collecting dilute solutions like rinsate. Maximum tank costs for rinsate tanks per facility assumed for this economic analysis are as follows:

- Tank costs for outdoor liquid structures (secondary units and containment pads) are estimated at $589 for a small-small facility, $1,653 for a medium-small facility, and $2,356 for large-small and large facilities (Table H.1).

[31] The economic analysis estimates rinsate tank costs for all facilities, even small facilities.
[32] The analysis of the final rule includes costs for rinsate containers at facilities of all sizes.
[33] In 1998, costs for large rinsate tanks were quoted at $1,000 ($1,180 in 2005$) for a flat-bottomed tank and about $2,300 ($2,715 in 2005$) for a cone-shaped tank on a steel support.

- Tank costs for indoor liquid structures and for dry bulk containers (indoor and outdoor) are estimated at $342 for a small-small facility, $589 for a medium-small facility, and $1,301 for large-small and large facilities (Tables H.3 and H.5).[34]

For large-small and large facilities, these costs are assumed to cover the range of expense options associated with the purchase of either a 3,000-gallon tank or two 1,000-gallon tanks. Since there are very few crops, with the exception of corn, that use large quantities of pesticides, even a large facility will not need more than two or three rinsate tanks.[35]

New Containment Pads. Facilities that have stationary bulk pesticide storage containers must have a containment pad adjacent to the bulk containers for activities such as loading into or unloading from the bulk containers, and rinsing and/or refilling containers or equipment from the bulk containers. Pad size will vary among facilities, depending on site-specific needs. Although facilities may choose to have more than one pad, it is assumed that one sufficiently sized pad may be used as a multi-purpose pad. Typical multi-purpose pad sizes are as follows: a small pad is 15 feet by 30 feet; a medium pad is 25 feet by 50 feet; and a large pad is 60 feet by 50 feet. We assume that small-small and medium-small agricultural refillers require a small containment pad, large-small and large agricultural refillers as well as ground applicators require a medium pad, and aerial applicators require a large pad to accommodate a plane. The smaller containment pad (15 feet by 30 feet) is assumed sufficient for facilities that do not have bulk storage, but that use and clean refillable containers.

This analysis assumes that new containment pads will be constructed of concrete. Concrete costs for a pad are estimated at $\$5.48/ft^2$. The cost of the berm around the perimeter of the pad includes concrete costs at $\$1.78/ft^2$; forms at $2.74/ft; and grout at $1.24/ft. Sump costs for containment pads are estimated at $274 for a small-small facility and at $411 for a medium-small, large-small, and large facility. (See Table H.7.)

As with new secondary containment units, precipitation and pesticide rinsate that collect on outdoor containment pads must be stored and used or disposed of properly. Appropriate storage containers must contain rinsate/precipitation volumes associated with small, medium, and large outdoor containment pads. Indoor bulk storage facilities are assumed to have a concrete floor where dispensing into and out of the bulk containers is conducted. In this analysis, existing floors are assumed to be flat and of uniform elevation without sumps. For new containment pads in existing facilities, unit costs were developed for two indoor containment pad scenarios: (1) concrete is added to the existing floor to allow for the required slope and a sump is added and (2) the existing concrete floor is removed and a new sloped pad is constructed. Rinsate tank costs are presented in the previous section on new secondary containment units.

[34] These costs are based on prices quoted from manufacturers in 1998. For consistency, these costs are presented in 2005 dollars for the facility-level analysis based on an inflation factor derived from the CPI-U "All Items" Index (U.S. Department of Labor, 2005).

[35] To avoid double counting, costs for only one set of rinsate tanks is calculated for outdoor facilities that have both a containment pad and secondary containment.

4.1.1 Representative Facility Costs (Non-Discounted) for Agricultural Refillers

This section presents estimated capital costs, O&M costs, and intermittent costs for new secondary containment structures and pads by representative facility for agricultural refilling establishments. Costs for new secondary containment structures and pads are estimated for both indoor and outdoor liquid storage and for stationary bulk storage of dry pesticides. Non-discounted costs are later presented as an equivalent, constant-level cost per year.

Tables H.1 through H.10 in Appendix H show the estimated capital, O&M, and intermittent costs to install new secondary containment units and pads at agricultural refillers. These costs were initially calculated in 1992 dollars. These facility-level costs are presented in the discussion below in terms of 2005 dollars and have been inflated using the CPI-U "All" index, reported by the Bureau of Labor Statistics (U.S. Department of Labor, 2005). Table 4.2 presents a summary of these estimated 2005 costs.

New Containment Structures: Outdoor Bulk Liquid Storage. Table 4.2 presents the estimated capital, O&M, and intermittent costs for the secondary containment of outdoor bulk liquid storage containers. Capital costs range from $5,600 at the small-small representative facility to $18,250 at the large representative facility for a design option that includes a sump and a rinsate/precipitation container. O&M costs cover monthly inspections/recordkeeping, spill cleanup, rinsate/precipitation pumping, and removal of collected rinsate/precipitation to an off-site area for application as a pesticide (see Table H.2). Facilities that can use all or part of the rinsate/precipitation as make-up water will incur lower O&M costs. Annual O&M costs associated with these secondary containment units range from $1,160 for the small-small facility to $2,760 for the large facility, assuming that a rinsate/precipitation tank and a sump are used. Intermittent costs are incurred to repair cracks, gaps, and seams (see Table H.2). Intermittent costs are estimated to range from $50 for the small-small facility to $130 for the large facility.

Table 4.2. Summary of Facility-Level Costs (2005$) to Install New Secondary Containment Units and Pads, Representative Agricultural Refiller and Commercial Applicator Facilities

Compliance Cost Item	$ per Facility [a]			
	Small-Small Facility	Medium-Small Facility	Large-Small Facility	Large Facility
AGRICULTURAL REFILLERS				
Secondary Containment - Bulk Liquid/Outdoor				
Capital	5600	10300	18250	18250
O&M	1160	1540	2760	2760
Intermittent	50	120	130	130
Secondary Containment - Bulk Liquid/Indoor				
Capital	2170	2500	3780	3780
O&M	740	1050	1490	1490
Intermittent	50	120	130	130
Secondary Containment -Bulk Dry (1 Container)				
Capital	na	5230	5230	5230
O&M	na	850	850	850
Intermittent	na	100	100	100
AERIAL APPLICATORS				
Secondary Containment - Bulk Liquid/Outdoor				
Capital	5600	10300	18250	na
O&M	1160	1550	2790	na
Intermittent	50	120	130	na
GROUND APPLICATORS				
Secondary Containment - Bulk Liquid/Outdoor				
Capital	na	na	10300	na
O&M	na	na	1550	na
Intermittent	na	na	120	na
REFILLERS & APPLICATORS				
Containment Pads - Outdoor (Scenarios 1 & 2) [b]				
Capital	5,850-6,600	16,110-18,310	34,060-34,810	34,060-34,810
O&M	1190	2210	5100	5100
Intermittent	40	50	70	70
Containment Pads - Indoor (Scenarios 1 & 2) [c]				
Capital	6,860-8,790	18,730-23,970	50,570-53,840	50,570-53,840
O&M	740	1100	1490	740
Intermittent	40	50	70	40

[a] Inflated from 1992$ costs (Tables H.1 to H.10) trends in the Consumer Price Index "All Items" (U.S. Department of Labor, 2005). Figures may not match totals in Appendix H due to rounding.

[b] Scenario 1 (both secondary containment units and containment pads) and Scenario 2 (pad only). Avoids duplicating costs.

[c] Scenario 1 (use existing concrete floor as base) and Scenario 2 (demolish/remove existing concrete floor; reconstruct pad).

New Containment Structures: Indoor Bulk Liquid Storage. Table 4.2 presents the estimated capital, O&M, and intermittent costs of secondary containment units for indoor bulk liquid storage containers. Capital costs range from $2,170 for the small-small representative facility to $3,780 for the large facility. Costs include a berm, rinsate/precipitation tank, portable pump and hose, pipes and fixtures, and contractor's and contingency fees (see Table H.3). No costs are estimated for a concrete pad, because it is assumed that all existing tanks are installed over a concrete floor. Annual O&M costs are between $740 and $1,490 per facility, and include the cost of spill cleanup and monthly inspection/recordkeeping. Intermittent costs to repair cracks, gaps, and seams are estimated between $50 for a small-small facility and $130 for a large facility. (See Table H.4 for itemized O&M and intermittent costs.)

New Containment Structures: Stationary Bulk Dry Storage. Capital, O&M, and intermittent costs are estimated for secondary containment of stationary bulk storage containers for dry pesticides (bulk solids) for one container (Table 4.2). A facility with one dry bulk container is expected to incur capital costs of $5,230 (see Table H.5 for itemized capital costs). Annual O&M costs are estimated at $850 for one container and consist of spill cleanup, rinsate/precipitation pumping, and monthly inspection/recordkeeping costs. Intermittent costs incurred to repair cracks, gaps, and seams are estimated at $100. (See Table H.6 for itemized O&M and intermittent costs.) No costs are estimated for small-small refiller facilities with outdoor bulk dry storage, since it is assumed that only medium-small, large-small, and large facilities handle dry bulk pesticides.

New Containment Pads: Outdoor Bulk Liquid Storage. Table 4.2 presents estimated capital, O&M, and intermittent costs for two outdoor containment pad scenarios. Scenario 1 evaluates the capital costs of facilities that also must have secondary containment of bulk storage containers. For these facilities, costs range from $5,850 for the small-small pad to $34,060 for the large pad. Scenario 2 estimates capital costs to facilities that require only a new containment pad, including the costs of a pump and hose. Costs at these facilities are estimated to range from $6,600 for a small-small pad to $34,810 for a large pad. Capital costs under Scenario 1 are lower than those estimated under Scenario 2 because the costs of a portable pump and hose have already been accounted for within the overall secondary containment costs under Scenario 1. (See Table H.7 for itemized capital costs.) O&M and intermittent costs are the same across both scenarios. Annual O&M costs cover spill cleanup, rinsate/precipitation pumping, transporting the rinsate/precipitation off-site for application to crops, and monthly inspection and recordkeeping. These costs are estimated to range from $1,190 per year for the small-small pad to $5,100 per year for the large pad. Intermittent costs are estimated at no more than $70 for all pad sizes to cover the repair of cracks, gaps, and seams. (See Table H.9 for itemized O&M and intermittent costs.)

New Containment Pads: Indoor Bulk Liquid Storage. Table 4.2 presents the estimated capital, O&M, and intermittent costs for two indoor containment pad scenarios. Scenario 1 estimates capital costs for pads built over existing concrete floors. For these facilities, costs range from $6,860 for the small-small pad to $50,570 for the large pad. Scenario 2 estimates capital costs for facilities where the existing concrete floor is removed prior to construction of the containment pad. Costs at these facilities are between $8,790 for the small-small pad and $53,840 for the large pad. The condition and age of the existing concrete floor will likely be a

primary factor in deciding whether to remove it prior to construction. (See Table H.8 for itemized capital costs.) Annual O&M costs for spill cleanup, rinsate/precipitation pumping, and monthly inspections/recordkeeping are estimated to be between $740 for the small-small indoor containment pad and $1,490 for the large pad (Table 4.2). Intermittent costs to repair cracks are no more than $70 for all pad sizes (Table 4.2). (See Table H.9 for itemized O&M and intermittent costs.)

4.1.2 Representative Facility Annualized Costs to Agricultural Refillers

Compliance costs have been converted to represent the annual costs associated with the construction of new secondary containment units and containment pads, based on the facility-level costs previously discussed. Appendix B presents the non-discounted facility-level schedule of costs across the 20-year analysis period from which annualized costs are based. Summary tables of annualized costs (using the methodology discussed in Appendix A) are provided in Tables 4.3-4.6.

Annualized Costs: Secondary Containment Units. Tables 4.3 and 4.4 present the estimated annual requirements (calculated using a 3 percent and 7 percent discount/interest rate, respectively) across representative facility sizes for both outdoor (liquid and dry) and indoor (liquid) secondary containment.[36] For small-small facilities, annualized costs are estimated at $1,253 for sites with outdoor bulk liquid storage and $718 for sites with indoor bulk liquid storage. For medium-small facilities, estimated annualized costs are $1,842 for sites with outdoor liquid storage and $991 for sites with indoor liquid storage. For large-small and large facilities, estimated annualized costs are $3,277 for sites with outdoor liquid storage and $1,415 for sites with indoor liquid storage. Medium-small, large-small, and large facilities that also have dry bulk storage will incur additional annualized costs of $994 for one dry bulk container. No costs are estimated for small-small refiller facilities with outdoor bulk dry storage, since it is assumed that only medium-small, large-small, and large facilities handle dry bulk pesticides. (See Table 4.3.)

Annualized Costs: Secondary Containment Pads. Annualized costs for containment pads for outdoor and indoor facilities are shown under two different scenarios in Tables 4.5 and 4.6. It is assumed that small-small and medium-small facilities will require a small pad and large-small and large agricultural refiller facilities will require a medium-sized pad.[37] The containment pad annualized costs for indoor agricultural facilities range from $997 at a small-small facility to $1,990 at a large facility, if existing concrete floors are used as the base for a new containment pad. If the existing floor is removed prior to constructing a new pad, estimated annualized costs range from $1,112 at a small-small facility to $2,303 at a large facility. (See Table 4.5.)

Outdoor pad scenarios are calculated for facilities that require both secondary units and pads (Scenario 1) and facilities that require pads only (Scenario 2). For outdoor bulk storage, a small-small and medium-small facility will incur annualized costs for a small containment pad of

[36] Note: All annual revenue figures are calculated using both a 3 percent and 7 percent discount rate in the discounting procedure and both a 3 percent and 7 percent interest rate in the annualization procedure. When referred to in the text, the annual costs at the 3 percent rate will be presented. A separate table is presented for costs at each rate.

[37] Costs for a large pad are applicable only to aerial applicators.

between $1,290 under Scenario 1 and $1,335 under Scenario 2.[38] Small-small agricultural refiller facilities that need only a containment pad because they are conducting operational activities from

Table 4.3. Summary of Annualized Costs for Compliance with Containment Regulations, Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators,[a] Install NEW Secondary Containment Units, 2005$, 3% Discount Rate

Location/Design Option	Small-Small	Medium-Small	Large-Small	Large
Secondary Containment, Agricultural Refillers				
Liquid bulk, outdoors	1,253	1,842	3,277	3,277
Liquid bulk, indoors	718	991	1,415	1,415
Dry bulk, outdoors				
One container	n/a	994	994	994
Two containers	n/a	1,351	1,351	1,351
Secondary Containment, Commercial Applicators				
Liquid bulk, outdoors[b]				
Aerial[c]	1,253	1,850	3,301	n/a
Ground[d]	n/a	n/a	1,850	n/a

[a] Annualized costs based on non-discounted cost estimates, annualized using the methodology discussed in Appendix A. Individual non-discounted cost estimates are shown in Appendix B. Estimated 1992 facility-level costs have been inflated to 2005 dollars based on reported trends in the Consumer Price Index, "All Items" (U.S. Department of Labor, 2005).

[b] No independent commercial applicators are known to store bulk quantities of dry pesticides (greater than 4000 pounds).

[c] The annualized cost for the small-small, medium-small and large-small representative agricultural facility is used as a proxy for any affected small-small, medium-small and large-small commercial aerial applicators.

[d] The annualized cost for the medium-small representative agricultural facility is used as a proxy for any affected large commercial ground applicators.

[38] Costs are higher under Scenario 2 because the cost for a pump and portable hose is included. This cost is included as a "secondary containment" cost under Scenario 1 and is not included to avoid double-counting.

Table 4.4. Summary of Annualized Costs for Compliance with Containment Regulations, Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators, [a] Install NEW Secondary Containment Units, 2005$, 7% Discount Rate

Location/Design Option	Small-Small	Medium-Small	Large-Small	Large
Secondary Containment, Agricultural Refillers				
Liquid bulk, outdoors	1,225	1,838	3,270	3,270
Liquid bulk, indoors	682	932	1,335	1,335
Dry bulk, outdoors				
One container	n/a	986	986	986
Two containers	n/a	1,338	1,338	1,338
Secondary Containment, Commercial Applicators				
Liquid bulk, outdoors [b]				
Aerial [c]	1,225	1,838	3,270	n/a
Ground [d]	n/a	n/a	1,838	n/a

[a] Annualized costs based on non-discounted cost estimates, annualized using the methodology discussed in Appendix A. Individual non-discounted cost estimates are shown in Appendix B. Estimated 1992 facility-level costs have been inflated to 2002 dollars based on reported trends in the Consumer Price Index, "All Items" (U.S. Department of Labor, 2005).

[b] No independent commercial applicators are known to store bulk quantities of dry pesticides (greater than 4000 pounds).

[c] The annualized cost for the small-small, medium-small and large-small representative agricultural facility is used as a proxy for any affected small-small, medium-small and large-small commercial aerial applicators.

[d] The annualized cost for the medium-small representative agricultural facility is used as a proxy for any affected large commercial ground applicators.

smaller non-bulk containers have annualized costs of $1,335 for the small pad. Annualized costs range from $2,706 under Scenario 1 to $2,838 under Scenario 2 for the medium pad used by large-small and large agricultural refillers. (See Table 4.5.)

Annualized Costs: Secondary Containment Units and Pads. To comply with the final containment standards, many refillers may incur costs across more than one of the individual cost components evaluated in this analysis. These costs are combined to derive the total annualized cost estimate for a single representative facility (Tables 4.7 and 4.8). For this economic analysis, a small-small agricultural refiller with outdoor liquid bulk storage that needs both secondary containment and a containment pad will have annualized costs estimated at $2,544 per facility. A medium-small facility requiring both structures has estimated annualized costs of $3,133 per facility, and large-small and large facilities have annualized costs of $5,983 per facility. Small-small and medium-small facilities requiring only a containment pad will have annualized costs of $1,335 per facility. Large-small and large facilities requiring only a (medium) containment pad have estimated annualized costs of $2,838 per facility. Both large-small and large facilities that require a containment pad only are assumed to already have secondary containment structures in place. (See Table 4.7.)

Small-small agricultural refillers that do not have bulk storage but that require a containment pad for certain operational activities associated with smaller non-bulk containers (e.g., refilling refillable containers from a 500-gallon container) have estimated annualized costs of $1,335 per

facility (Table 4.7). Facilities with indoor storage facilities requiring both secondary containment and a pad will have annualized costs between $1,715 (small-small facility) and $3,405 (large facility). Indoor facilities that require only a new containment pad have estimated annualized costs ranging from $1,112 at a small-small and a medium-small facility to $2,303 at a large-small and a large facility. (See Table 4.7.)

Refillers with both liquid and dry bulk storage face the highest annual cost to comply with the final containment regulations. In addition to costs for a containment pad, such facilities have been assigned two annualized costs for secondary containment: one for the liquid bulk containers and one for a single dry bulk container. Separate secondary containment units are assumed for liquid and dry pesticides, but it is assumed that liquid and dry pesticides will be placed in close proximity so that one containment pad may be used for dispensing activities of both types. Under these conditions, annualized costs per facility are estimated at $4,483 for the medium-small representative facility and $5,983 for the large-small and large facilities (Table 4.7). If the dry bulk container at actual facilities is not adjacent to the liquid bulk containers, costs will likely be greater. In that case, a second containment pad would be needed and additional annualized costs of $2,838 per facility would be incurred (Table 4.7). Annualized costs for secondary containment may be overstated, if the dry bulk container can be contained within the same secondary containment structure as the liquid bulk containers.

Aggregate industry costs are then computed by multiplying the estimated annualized costs by the estimated number of facilities potentially affected by the regulations (see Chapter 3 for a description of the number of affected agricultural refiller facilities). Aggregate industry costs incurred to construct new containment structures at agricultural refiller facilities are estimated at $2.47 million on an annualized basis (Table 4.7). The breakdown of this estimated aggregate cost by type of facility is as follows: (1) for agricultural refillers with outdoor liquid bulk storage, the estimated cost across all facilities is $0.88 million; (2) for agricultural refillers that also have dry bulk storage, the estimated cost across all facilities is an additional $0.14 million; (3) for agricultural refillers with indoor liquid bulk storage, the estimated cost across all facilities is $0.25 million; (4) for agricultural refillers with indoor liquid bulk storage that need only containment pad, the estimated cost across all facilities is $0.12 million, and (5) for agricultural refillers refilling from smaller (non-bulk) storage containers, the estimated cost across all facilities is $0.75 million. By facility size, the aggregate industry costs are estimated at $2.00 million for small-small refiller facilities, $0.32 million for medium-small refiller facilities, $0.08 million for large-small refiller facilities, and $0.06 million for large refiller facilities. (See Table 4.7.)

Table 4.5. Summary of Annualized Costs for Compliance with Containment Regulations, Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators, Install NEW Secondary Containment Units and Pads, 2005$, 3% Discount Rate[a]

	All Affected Facilities ($/Facility)		
	Small Pad (15' x 30')	**Medium Pad [b] (25' x 50')**	**Large Pad (60' x 50')**
OUTDOOR CONTAINMENT PADS			
Scenario 1: Facilities requiring both secondary containment and containment pads			
Small-Small/Medium-Small agricultural refiller	1,290	---	---
Large-Small/Large agricultural refiller	---	2,706	---
Any size aerial applicator (Small-, Medium-, and Large-Small)	---	---	6,054
Large-Small ground applicator	---	2,706	---
Scenario 2: Facilities requiring only a containment pad for compliance [c]			
Small-Small/Medium-Small agricultural refiller	1,335	---	---
Large-Small/Large agricultural refiller	---	2,838	---
Any size aerial applicator (Small-, Medium-, and Large-Small)	---	---	6,098
Large-Small ground applicator	---	2,838	---
INDOOR CONTAINMENT PADS [d]			
Scenario 1: Use existing concrete floor as base for new containment pad			
Small-Small/Medium-Small agricultural refiller	997	---	---
Large-Small/Large agricultural refiller	---	1,990	---
Scenario 2: Demolish existing concrete floor and construct new containment pad			
Small-Small/Medium-Small agricultural refiller	1,112	---	---
Large-Small/Large agricultural refiller	---	2,303	---

[a] Annualized costs based on non-discounted cost estimates, annualized using the methodology discussed in Appendix A. Individual non-discounted cost estimates are shown in Appendix B. Estimated 1992 facility-level costs have been inflated to 2005$ dollars based on reported trends in the Consumer Price Index, "All Items" (U.S. Department of Labor, 2005).

[b] The annualized costs for the medium-sized containment pad have been assigned to both the large-small and large representative agricultural facilities. The large for-hire ground applicator has been assigned the same annualized cost as the large-small agricultural facility.

[c] The cost for a pad is higher than under Scenario 1 because the cost for a pump and portable hose are included. That cost is included as a "secondary containment" cost under Scenario 1 and is not included as a pad cost to avoid double counting.

[d] Indoor bulk pesticide storage facilities that dispense into or out of indoor bulk containers are assumed to be conducting such activities over a concrete floor. Owners/operators may elect to use the existing concrete as a base for the containment pad, or they may choose to demolish the existing concrete prior to construction of the pad. Annualized costs are shown for both scenarios. The annualized cost for the medium containment pad has been assigned to both the large-small and large representative agricultural facilities. The large for-hire ground applicator has been assigned the same annualized cost as the large-small agricultural facility.

Table 4.6. Summary of Annualized Costs for Compliance with Containment Regulations, Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators, Install NEW Secondary Containment Units and Pads, 2005$, 7% Discount Rate[a]

	All Affected Facilities ($/Facility)		
	Small Pad (15' x 30')	**Medium Pad[b] (25' x 50')**	**Large Pad (60' x 50')**
OUTDOOR CONTAINMENT PADS			
Scenario 1: Facilities requiring both secondary containment and containment pads			
Small-Small/Medium-Small agricultural refiller	1,262	---	---
Large-Small/Large agricultural refiller	---	2,719	---
Any size aerial applicator	---	---	6,046
Large ground applicator	---	2,719	---
Scenario 2: Facilities requiring only a containment pad for compliance[c]			
Small-Small/Medium-Small agricultural refiller	1,316	---	---
Large-Small/Large agricultural refiller	---	2,878	---
Any size aerial applicator	---	---	6,100
Large ground applicator	---	2,878	---
INDOOR CONTAINMENT PADS[d]			
Scenario 1: Use existing concrete floor as base for new containment pad			
Small-Small/Medium-Small agricultural refiller	1,019	---	---
Large-Small/Large agricultural refiller	---	2,128	---
Scenario 2: Demolish existing concrete floor and construct new containment pad			
Small-Small/Medium-Small agricultural refiller	1,158	---	---
Large-Small/Large agricultural refiller	---	2,505	---

[a] Annualized costs based on non-discounted cost estimates, annualized using the methodology discussed in Appendix A. Individual non-discounted cost estimates are shown in Appendix B. Estimated 1992 facility-level costs have been inflated to 2005$ dollars based on reported trends in the Consumer Price Index, "All Items" (U.S. Department of Labor, 2005).

[b] The annualized costs for the medium-sized containment pad have been assigned to both the large-small and large representative agricultural facilities. The large for-hire ground applicator has been assigned the same annualized cost as the large-small agricultural facility.

[c] The cost for a pad is higher than under Scenario 1 because the cost for a pump and portable hose are included. That cost is included as a "secondary containment" cost under Scenario 1 and is not included as a pad cost to avoid double-counting.

[d] Indoor bulk pesticide storage facilities that dispense into or out of indoor bulk containers are assumed to be conducting such activities over a concrete floor. Owners/operators may elect to use the existing concrete as a base for the containment pad, or they may choose to demolish the existing concrete prior to construction of the pad. Annualized costs are shown for both scenarios. The annualized cost for the medium containment pad has been assigned to both the large-small and large representative agricultural facilities. The large for-hire ground applicator has been assigned the same annualized cost as the large-small agricultural facility. As compared to existing facilities, the pad size requirements are different (see Table 4.11). Existing facilities are more overbuilt (see Section 4.2), therefore it is assumed that for new facilities agricultural refillers will require smaller pad.

Table 4.7. Summary of Annualized Costs to Install New Secondary Containment Units and Pads, Representative Agricultural Refillers, 3% Discount Rate

Compliance Cost Item	Small-Small Facility	Medium-Small Facility	Large-Small Facility	Large Facility	All Facilities
AGRICULTURAL REFILLERS					
Outdoor Liquid Storage (A) Secondary Containment + Pad					
Number of Affected Facilities [a]	270	46	5	3	324
Annualized Cost/facility ($) [b]	2,544	3,133	5,983	5,983	0
Subtotal, aggregate cost [c]	687,138	1,44,797	28,991	17,673	8,78,599
(B) Containment Pad Only					
Number of Affected Facilities	200	34	4	2	240
Annualized Cost/facility ($)	1,335	1,335	2,838	2,838	0
Subtotal, aggregate cost	2,66,845	45,660	10,173	6,201	3,28,879
Outdoor Dry Storage (A) Secondary Containment + Pad					
Number of Affected Facilities	n/a	17	6	6	28
Annualized Cost/facility ($)	n/a	4,483	5,983	5,983	0
Subtotal, aggregate cost	n/a	76,158	33,882	33,882	1,43,922
Indoor Liquid Storage (A) Secondary Containment + Pad [d]					
Number of Affected Facilities	116	20	2	1	139
Annualized Cost/facility ($)	1,715	1,988	3,405	3,405	0
Subtotal, aggregate cost	1,98,559	39,381	7,070	4,310	2,49,320
(B) Containment Pad Only					
Number of Affected Facilities	86	15	2	1	103
Annualized Cost/facility ($)	1,112	1,112	2,303	2,303	0
Subtotal, aggregate cost	95,258	16,300	3,538	2,157	1,17,253
Non-Bulk Storage/Dispensing [e] **(A) Containment Pad**					
Number of Affected Facilities	561	n/a	n/a	n/a	561
Annualized Cost/facility ($)	1,335	n/a	n/a	n/a	0
Subtotal, aggregate cost	7,49,049	n/a	n/a	n/a	7,49,049
ALL AG. REFILLERS INDUSTRY TOTAL	19,96,849	3,22,296	83,654	64,224	2,467,023

[a] Number of facilities taken from Table G.3.
[b] Represents an aggregation of all relevant annualized costs per facility. Costs in the table may not add due to rounding. Annualized costs are based on those presented in Tables 4.3 and 4.5.
[c] Subtotals are not the exact product of number of affected facilities and Cost/Facility shown here due to rounding of number of facilities.
[d] Assumes affected facilities will use existing concrete floor as a base for building a containment pad.
[e] Refillers that conduct activities such as refilling refillable containers from smaller (non-bulk) containers.

Table 4.8. Summary of Annualized Costs to Install New Secondary Containment Units and Pads, Representative Agricultural Refillers, 7% Discount Rate

Compliance Cost Item	Small-Small Facility	Medium-Small Facility	Large-Small Facility	Large Facility	All Facilities
AGRICULTURAL REFILLERS					
Outdoor Liquid Storage (A) Secondary Containment + Pad					
Number of Affected Facilities [a]	270	46	5	3	324
Annualized Cost/facility ($) [b]	2,487	3,101	5,988	5,988	0
Subtotal, aggregate cost [c]	671,837	143,322	29,015	17,688	861,863
(B) Containment Pad Only					
Number of Affected Facilities	200	34	4	2	240
Annualized Cost/facility ($)	1,316	1,316	2,878	2,878	0
Subtotal, aggregate cost	263,105	45,020	10,317	6,289	324,731
Outdoor Dry Storage (A) Secondary Containment + Pad					
Number of Affected Facilities	n/a	17	6	6	28
Annualized Cost/facility ($)	n/a	4,439	5,988	5,988	0
Subtotal, aggregate cost	n/a	75,404	33,910	33,910	143,224
Indoor Liquid Storage (A) Secondary Containment + Pad [d]					
Number of Affected Facilities	116	20	2	1	139
Annualized Cost/facility ($)	1,701	1,951	3,462	3,462	0
Subtotal, aggregate cost	196,939	38,645	7,190	4,383	247,158
(B) Containment Pad Only					
Number of Affected Facilities	86	15	2	1	103
Annualized Cost/facility ($)	1,158	1,158	2,505	2,505	0
Subtotal, aggregate cost	99,169	16,969	3,849	2,346	122,332
Non-Bulk Storage/Dispensing [e] **(A) Secondary Containment + Pad**					
Number of Affected Facilities	561	n/a	n/a	n/a	561
Annualized Cost/facility ($)	1,316	n/a	n/a	n/a	0
Subtotal, aggregate cost	738,552	n/a	n/a	n/a	738,552
ALL AG. REFILLERS INDUSTRY TOTAL	1,969,603	319,360	84,280	64,617	2,437,860

[a] Number of facilities taken from Table G.3.
[b] Represents an aggregation of all relevant annualized costs per facility. Costs in the table may not add due to rounding. Annualized costs based on those presented in Tables 4.4 and 4.6.
[c] Subtotals are not the exact product of number of affected facilities and Cost/Facility shown here due to rounding of number of facilities.
[d] Assumes affected facilities will use existing concrete floor as a base for building a containment pad.
[e] Refillers that conduct activities such as refilling refillable containers from smaller (non-bulk) containers.

4.1.3 Representative Facility Costs (Non-Discounted) for Commercial Applicators

This section presents estimated capital costs, operating and management (O&M) costs, and intermittent costs for new secondary containment structures and pads by representative facility for commercial (for-hire) aerial and ground applicators. These facility-level cost tables are aggregated are in Appendix H. All final costs are converted to current 2005 dollars, adjusting for inflation based on reported trends in the Consumer Price Index (U.S. Department of Labor, 2005). Costs are also presented as constant-level, annualized costs per year.

All independent commercial applicators (aerial and ground) are assumed to be small (i.e., small-small, medium-small, and large-small), and all bulk storage facilities for aerial and ground applicators are assumed to be outdoors. Furthermore, it is assumed that independent commercial applicators do not store bulk quantities of dry pesticides (i.e., there are no known facilities with containers that have a capacity greater than two metric tons).

New Containment Structures: Commercial Aerial Applicators. To estimate capital, O&M, and intermittent costs applicable for commercial aerial applicators with total bulk liquid storage ranging from 1,500 gallons to 20,000 gallons, we have transferred the cost estimates from similarly sized agricultural refiller facilities (e.g., small-small representative aerial applicator facilities are assumed to have the same secondary containment costs as the small-small representative agricultural refiller, because both have one 1,500 gallon container). (Table H.10 lists facility-level compliance costs transferred from similarly sized agricultural refiller facilities.)

Inflated to current 2005 dollars, estimated non-discounted capital costs to construct a secondary containment structure at aerial applicator facilities range from $5,600 at a small-small facility to $18,250 at a large-small facility, covering the cost for a precipitation/rinsate tank and sump, and other related construction costs (Table 4.2). Annual O&M costs are between $1,160 (small-small) and $2,760 (large-small). Intermittent repair costs are between $50 (small-small) and $130 (large-small) (Table 4.2). (See Table H.1 for itemized capital costs and Table H.2 for itemized O&M and intermittent costs.)

New Containment Structures: Commercial Ground Applicators. Preliminary research indicates that the majority of commercial ground applicators work from non-bulk containers such as minibulks (Myrick, 1991a). Ground applicators are not profiled as representative facilities, but are considered to be comprised of all large-small facilities. For this analysis, ground applicators have been assigned the same capital, O&M, and intermittent costs as those estimated for medium-small agricultural refillers. Accordingly, capital costs for secondary containment structures are $10,300 per large-small facility. Annual O&M costs are $1,550 per facility, and intermittent costs are $120 per large-small facility (Table 4.2). (See Table H.1 for itemized capital costs and Table H.2 for itemized O&M and intermittent costs.)

4.1.4 Representative Facility Aggregate Annualized Costs to Commercial Applicators

Compliance costs have been converted to annualized costs and represent the annual costs associated with the construction of new secondary containment units and containment pads from the facility-level costs presented previously. Appendix B presents the non-discounted facility-

level schedule of costs across the 20-year analysis period from which annualized costs are based. Summary tables of annualized costs (using the methodology discussed in Appendix A) are provided in Tables 4.3-4.6.

Annualized Costs: Secondary Containment Units. Aerial applicators with liquid bulk storage may incur annualized costs for secondary containment units that range from $1,253 for small-small facilities to $3,277 for large-small facilities (Table 4.3).[39] Large-small ground applicators are assumed to incur annualized costs for secondary containment similar to that estimated for small-medium agricultural refillers at $1,842per facility (Table 4.3).

Annualized Costs: Secondary Containment Pads. Facilities that only require a large pad (aerial applicators) may face annualized costs of $6,061 per facility for facilities requiring both a secondary containment unit and a pad, and $6,106 per facility for facilities requiring a pad only (Table 4.5).[40] The same annualized cost for a medium containment pad estimated for large-small/large agricultural refillers is assumed for ground applicators: $2,708 per facility for facilities requiring both a secondary containment unit and a pad, and $2,840 per facility for facilities requiring a pad only (Table 4.5).

Annualized Costs: Secondary Containment Units and Pads. Combined annualized costs to aerial applicator facilities that require secondary containment units and a large containment pad range from $7,307 for a small-small facility to $9,355 for a large-small facility (Table 4.9). The annualized costs for ground applicator facilities are $4,556 for facilities that require secondary containment structures and a pad, and $2,838 for facilities that require only a pad (Table 4.9).[41]

Aggregate industry costs are then computed by multiplying the estimated annualized costs by the estimated number of affected facilities (see Chapter 3 for a description of the number of affected commercial applicator facilities). For commercial aerial and ground applicators, the aggregate industry cost to construct new containment structures is estimated at $0.22 million on an annualized basis (Table 4.9). The breakdown of estimated costs by category of facility is estimated at $0.12 million for aerial applicator facilities with outdoor liquid bulk storage requiring secondary containment units and pads, and is estimated at $0.02 million for ground applicators with outdoor liquid bulk storage requiring secondary containment units and pads (Table 4.9). For aerial applicator and ground applicator facilities requiring only the installation of a pad, estimated costs are $0.06 million and $0.01 million, respectively (Table 4.9).

The breakdown in costs by facility size is estimated at $0.05 million for small-small commercial applicators, $0.12 million for medium-small applicators, and $0.06 million for large-small applicators (Table 4.9).

---

[39] Note: All annual revenue figures are calculated using both a 3 percent and 7 percent discount rate in the discounting procedure and both a 3 percent and 7 percent interest rate in the annualization procedure. When referred to in the text, annual costs will be presented using the 3 percent rate. Tables 4.7 and 4.9 present the estimated costs at a 3 percent discount rate, while Tables 4.8 and 4.10 present the estimated costs at a 7 percent discount rate.

[40] The cost for a pad is higher when both secondary containment units and pads are required, because the costs for a pump and portable hose are included as "secondary containment" costs. To avoid double-counting, these costs are not included when only a pad is required.

[41] See Table 4.10 for annualized costs at a 7 percent discount rate.

4.1.5 Total Aggregate Annualized Costs

The total aggregate annualized costs to install new containment structures for all agricultural refillers and commercial applicators is $2.7 million (Table 4.9). Given that there are significantly more agricultural refiller facilities affected by the containment regulations, more than 90 percent (or $2.5 million) of the total cost of the installation of new containment structures is incurred by agricultural refillers. The breakdown in estimated costs by facility size is $2.0 million for small-small facilities (agricultural refillers account for 95 percent), $0.44 million for medium-small facilities (agricultural refillers account for 75 percent), $0.14 million for large-small facilities (agricultural refillers account for 60 percent), and $0.06 million for large facilities (agricultural refillers account for 100 percent—there are assumed to be no large commercial applicators in this analysis—see Table 4.9.)

Table 4.9. Summary of Annualized Costs to Install New Secondary Containment Units and Pads, Representative Commercial Applicator Facilities, 3% Discount Rate

Compliance Cost Item	Small-Small Facility	Medium-Small Facility	Large-Small Facility	Large Facility [a]	All Facilities
AERIAL APPLICATORS					
Outdoor Liquid Storage (A) Secondary Containment + Pad					
Number of Affected Facilities [b]	6	9	1	0	16
Annualized Cost/facility ($) [c]	7,307	7,903	9,355	0	0
Subtotal, aggregate cost	45,594	70,815	7,484	0	1,23,893
(B) Containment Pad Only					
Number of Affected Facilities	na	7	3	0	10
Annualized Cost/facility ($)	na	6098	6,098	0	0
Subtotal, aggregate cost	na	44,721	19,166	0	63,887
GROUND APPLICATORS [d]					
Outdoor Liquid Storage (A) Secondary Containment + Pad					
Number of Affected Facilities	na	na	5	0	5
Annualized Cost/facility ($)	na	na	4,556	0	0
Subtotal, aggregate cost	na	na	22,779	0	22,779
(B) Containment Pad Only					
Number of Affected Facilities	na	na	3	0	3
Annualized Cost/facility ($)	na	na	2,838	0	0
Subtotal, aggregate cost	na	na	9,291	0	9,291
ALL COMMERCIAL APPLICATORS INDUSTRY TOTAL	45,594	1,15,536	58,720	0	2,19,850
ALL AG. REFILLERS INDUSTRY TOTAL [e]	1,996,849	3,22,296	83,654	64,224	2,467,023
ALL REFILLERS & APPLICATORS COMBINED INDUSTRY TOTAL (Install New Structures)	2,042,443	437,832	142,374	64,224	2,686,874

[a] There are no commercial applicators that fit the definition of a large facility.
[b] Number of facilities taken from Table G.3.
[c] Represents an aggregation of all relevant annualized costs per facility. Costs in the table may not add due to rounding. Annualized costs based on those presented in Tables 4.3 and 4.5.
[d] All bulk facilities are assumed to be large-small, with a bulk storage profile similar to the medium-small agricultural refiller (e.g., annualized costs calculated for the medium-small agricultural refiller are used as proxies for the large-small ground applicator).
[e] Estimates from Table 4.7.

Table 4.10. Summary of Annualized Costs to Install New Secondary Containment Units and Pads, Representative Commercial Applicator Facilities, 7% Discount Rate

Compliance Cost Item	Small-Small Facility	Medium-Small Facility	Large-Small Facility	Large Facility [a]	All Facilities
AERIAL APPLICATORS					
Outdoor Liquid Storage (A) Secondary Containment + Pad					
Number of Affected Facilities [b]	6	9	1	0	16
Annualized Cost/facility ($) [c]	7,271	7,884	9,316	0	0
Subtotal, aggregate cost	45,370	70,645	7,453	0	123,468
(B) Containment Pad Only					
Number of Affected Facilities	na	7	3	0	10
Annualized Cost/facility ($)	na	6,100	6,100	0	0
Subtotal, aggregate cost	na	44,736	19,173	0	63,909
GROUND APPLICATORS [d]					
Outdoor Liquid Storage (A) Secondary Containment + Pad					
Number of Affected Facilities	na	na	5	0	5
Annualized Cost/facility ($)	na	na	4,557	0	0
Subtotal, aggregate cost	na	na	22,785	0	22,785
(B) Containment Pad Only					
Number of Affected Facilities	na	na	3	0	3
Annualized Cost/facility ($)	na	na	2,878	0	0
Subtotal, aggregate cost	na	na	9,422	0	9,422
ALL COMMERCIAL APPLICATORS INDUSTRY TOTAL	45,370	115,381	58,832	0	219,584
ALL AG. REFILLERS INDUSTRY TOTAL [e]	1,969,603	319,360	84,280	64,617	2,437,860
ALL REFILLERS & APPLICATORS COMBINED INDUSTRY TOTAL (Install New Structures)	2,014,973	434,741	143,113	64,617	2,657,444

[a] There are no commercial applicators that fit the definition of a large facility.
[b] Number of facilities taken from Table G3.
[c] Represents an aggregation of all relevant annualized costs per facility. Costs in the table may not add due to rounding. Annualized costs based on those presented in Tables 4.4 and 4.6.
[d] All bulk facilities are assumed to be large-small, with a bulk storage profile similar to the medium-small agricultural refiller (e.g., annualized costs calculated for the medium-small agricultural refiller are used as proxies for the large-small ground applicator).
[e] From Table 4.8.

4.2 Compliance Costs for Existing Containment Structures

This section presents the cost assumptions and unit cost data that are used to compute the costs of complying with EPA's "critical" standards for existing containment structures. The results of the facility-level cost analysis are also presented. To comply with the final containment regulation, facilities will incur costs to retrofit existing secondary containment structures and pads. Costs of compliance with these standards are calculated by representative facility for agricultural refillers and for commercial (for-hire) applicators. Actual costs per facility will depend on the number of structures to retrofit and the degree to which such structures or containers are out of compliance (see Chapter 3 for a description of the level of compliance). Many facilities may have only a secondary containment structure, and some may have only a containment pad.

Existing Secondary Containment Units. All existing secondary containment units are assumed to already comply with the requirement that construction materials be reinforced concrete or some other rigid material compatible with the pesticide(s) stored within the unit. As a result, unit costs were not developed to represent the retrofit of existing structures to concrete from some other material, such as natural earthen material, unfired clay, and asphalt, which are specifically prohibited construction materials. Even though some states may allow lined earthen containment structures,[42] no facility is known to have such a structure for pesticide containment. Earthen structures are generally used to provide containment for larger fertilizer storage containers. In addition, all existing bulk liquid units are assumed to have the containment capacity required by the critical standards to store 100 percent of the volume of the largest container, plus any displacement volume. Furthermore, existing walls have sufficient freeboard to prevent water from seeping or flowing onto the containment structures from adjacent land. These assumptions are based on information obtained from industry experts and state agency personnel, indicating that most secondary containment units are "overbuilt" in terms of capacity. As a result, the cost items for retrofitting existing secondary containment units include the cost to seal floor and discharge outlets; repair all cracks, gaps, and seams; and conduct monthly inspections and keep inspection and maintenance records. All costs are in 2005 dollars based on trends in the Consumer Price Index.[43] The unit costs are presented in Appendix H (Table H.11).

To estimate costs associated with sealing all cracks, gaps, and seams, we used a unit cost of $2.84/ft for routing, cleaning, and grouting cracks—whether to initially seal cracks to comply with the final regulations or to routinely seal cracks over time. Any floor drains or discharge outlets must also be sealed: labor and grout costs are estimated at $54.78 per hour and at $11.41/ft^3, respectively. The cost for a portable pump and hose to remove collected precipitation or other material is estimated at $548. (See Table H.11.)

[42] Minnesota, Vermont, and Wisconsin have pesticide containment regulations specifying that earth or asphalt with a liner may be used. Regulations in six states (Kansas, Louisiana, Missouri, North Dakota, Ohio, and West Virginia) do not specify the type of containment material.

[43] To update final industry compliance costs to current year dollars (April 2005), we apply a CPI-U "All Items" based adjustment factor to account for general price inflation (U.S. Department of Labor, 2005).

No unit costs were developed for the protection of appurtenances and containers against damage from personnel and moving equipment.[44] Unit costs were also not developed for O&M requirements, such as the handling of collected pesticide residues or the cleanup of spills or leaks, since owners/operators of existing containment units are already managing these activities. However, monthly inspection and recordkeeping costs of $28 per hour are included (Table H.11).

Typically, stationary dry bulk pesticide storage containers are installed over concrete pads. The facilities are expected to incur cost to repair cracks, gaps and seams. These estimates are the same as those for the bulk liquid containers. Since only the medium-small, large-small and large agricultural refillers are assumed to have bulk dry containers; these costs are applicable to only these categories.

Existing Containment Pads. Retrofitting containment pads to comply with the critical criteria specified in the final containment regulations will involve sealing cracks, gaps, and seams in the structure; repairing new cracks as they appear; and conducting monthly inspections and recordkeeping. To calculate costs, similar unit costs apply as those represented for new containment structures (see Section 4.1). Some existing containment pads are expected to have drains that will require sealing. Unit labor costs are estimated at $54.78 per hour. Grout is estimated at $11.41/ft^3. (See Table H.12.)

A significant number of existing containment pads are assumed to be flat, with no sump. Although sloping to a sump is not required by the final rule for existing pads, 750-gallon capacity is required and could be achieved by a berm and/or a sump. For the purpose of this analysis, the cost of both a sump and a berm were included. Unit costs are based on the addition of a sump to an existing concrete containment pad. Unit costs for the sump include cutting into the existing concrete at $4.95/ft; demolishing the concrete over the sump area at $5.66/ft^2; excavation at $5.14 per cubic yard; gravel at $15.28 per cubic yard; reinforced concrete at $268 per cubic yard; steel edging (frame) at $11.58/ft; and a grate at $6.76/ft^2. (See Table H.12.)

The analysis also assumes that the height of the berm must be increased. The unit cost to rough up the existing concrete and apply a bonding agent is estimated at $4.10/ft^2. Concrete forms are calculated at $2.74/ft, and reinforcement bars are estimated at $3.02/ft. The cost of concrete for the berm is between $1.78/ft^2 and $3.02/ft^2, depending on the height of the berm. The excavation, gravel, and concrete unit costs for concrete ramps are the same as those assumed for the sump. (See Table H.12.) The unit cost for repairing cracks gaps and seams is the same as those assumed for existing secondary containment structures.

Existing bulk pesticide storage containers. The final rule requires existing containers to be anchored to prevent flotation in case of a spill. In order to prevent flotation, new containers must be anchored or elevated. Typical bulk liquid storage containers at agricultural refiller and applicator facilities have an assumed capacity range of 1,500 gallons to 6,000 gallons, and are

[44] Possible means of protection include supports to prevent sagging, flexible connections, the use of guardrails, barriers, and protective cages. The berm itself should serve as a protection for bulk storage containers within a secondary containment unit, and simple blocks of wood or concrete blocks can be used, at an insignificant cost, to prevent the sagging of piping.

constructed of either plastic or steel. Owners/operators may replace flat-bottomed containers with cone-shaped containers, but costs will likely be greater and will vary, depending on the capacity and construction material of the container. We assume that all facilities incur the same anchoring cost regardless of facility size and bulk container type (plastic or steel). Initial costs are $479 per container to move the container and to cover the labor for drilling in anchors and altering the plumbing. Contractor's and contingency fees are $72 and $28, respectively. Annual costs to inspect the containers and maintain records are $32.[45] (See Table H.13.)

4.2.1 Representative Facility Costs (Non-Discounted) for Agricultural Refillers

This section presents capital, O&M, and intermittent costs to retrofit existing containment structures and bulk storage containers of bulk liquid and dry pesticides. Costs associated with meeting the critical standards are estimated by representative facility for agricultural refillers (refilling establishments). Costs (non-discounted) are estimated at the facility level for representative firms in 2005 dollars. These facility-level cost tables are aggregated in Appendix H (Tables H.11-H.13). All final costs, discussed below, are inflated to current 2005 dollars based on reported trends in the Consumer Price Index, and are also converted to constant-level, annualized costs as per the method described in Appendix A. Appendix B presents the non-discounted facility-level schedule of costs across the 20-year analysis period from which annualized costs are based.

Existing Secondary Containment Structures. Compliance costs to retrofit existing secondary containment units for bulk liquid storage containers include the sealing of floor drains or discharge outlets; the repair of cracks, gaps, and seams; and monthly inspection of facilities. Costs associated with expanding liquid containment capacity are not estimated, since all existing liquid bulk units are already assumed to have the required containment capacity to store 100 percent of the volume of the largest container. For dry bulk storage, costs are estimated for the repair of all cracks, gaps, and seams; and for monthly inspection of facilities.

Initial costs (i.e., seal floor drains and outlets, and repair existing cracks, gaps, and seams) for bulk liquid containment are $740 for all facility sizes (Table 4.11). Intermittent costs (i.e., repair existing cracks, gaps, and seams) are incurred every 5 years (years 8, 13, and 18) assuming that the containment structure would be brand new in the compliance year throughout the life of the existing units. Assuming that these structures meet the requirement that secondary containment structures be leakproof, the intermittent costs are estimated between $40 for a small-small facility and $140 for a large facility. Annual O&M costs include monthly inspection and the recording of inspection information, estimated at $30 across all facility sizes. For dry bulk containment at medium-small, large-small, and large agricultural refiller facilities, intermittent costs are estimated at $100. O&M costs are also $30 per facility for bulk dry containers (Table 4.11). (See Table H.11 for itemized costs.)

Existing Containment Pads. Table 4.11 presents the costs for facilities to comply with the critical standards for existing containment pads, expressed in 2005 dollars. Compliance costs to retrofit existing pads include the addition of a 750-gallon capacity sump, the sealing of all drains; the repair of all cracks, gaps, and seams; and monthly inspection of facilities (Table H.12).

[45] The numbers in table are rounded to the nearest $10.

Capital costs of adding a sump range from $1,660 for a small-small facility to $4,870 for a large facility. Initial costs to seal drains or discharge outlets in the containment pad are estimated at $80 per pad, regardless of size. Sealing all existing cracks, gaps, and seams costs $30 for a small containment pad, $60 for a medium pad, and $70 for a large pad. O&M costs include $30 for monthly inspections/recordkeeping per facility. (See Table 4.11.)

Existing bulk pesticide storage containers. We assume that all facilities incur the same anchoring cost regardless of facility size and bulk container type (plastic or steel) (Table H.13). Initial costs are $580 for moving the container, the labor for drilling in anchors and altering the plumbing, as well as the contractor's and contingency fees. Annual O&M costs to inspect the containers and maintain records are $30. (See Table 4.11.)

Table 4.11. Summary of Facility-Level Costs (2005$) to Retrofit Existing Secondary Containment Units and Pads, Representative Agricultural Refillers and Commercial Applicator Facilities

Compliance Cost Item	$ per Facility [a]			
	Small-Small Facility	Medium-Small Facility	Large-Small Facility	Large Facility
AGRICULTURAL REFILLERS				
Secondary Containment - Bulk Liquid/Outdoor				
Capital	0	0	0	0
Initial	740	740	740	740
O&M	30	30	30	30
Intermittent	40	110	140	140
Secondary Containment - Bulk Dry/Outdoor [b]				
Capital	0	0	0	0
Initial	0	0	0	0
O&M	0	30	30	30
Intermittent (1 container)	0	100	100	100
COMMERCIAL APPLICATORS [b]				
Secondary Containment - Bulk Liquid Storage (Outdoor)				
Capital	0	0	0	0
Initial	740	740	740	na
O&M	30	30	30	na
Intermittent	40	110	140	na
REFILLERS AND APPLICATORS				
Containment Pads - Outdoor (Scenarios 1&2) [c]				
Capital	1660	2560	4870	4870
Initial	80	80	80	80
O&M	30	30	30	30
Intermittent	30	60	70	70
Container Anchoring (Plastic and Steel)				
Capital	0	0	0	0
Initial	580	580	580	580
O&M	30	30	30	30
Intermittent	0	0	0	0

[a] Inflated to 2005$ from trends in the Consumer Price Index "All Items" (U.S. Department of Labor, 2005). See Tables H.11-H.13 for unit costs. Figures may not match totals in Appendix H due to rounding.

[b] Both aerial and ground applicators.

[c] Applicable to facilities based on pad size requirements: small-small agricultural facility (small pad); medium-small facility (medium pad); and large-small and large facility (large pad). As compared to new facilities the pad size requirements are different (see Table 4.6). Existing facilities are more overbuilt (see Section 4.2), therefore it is assumed that for new facilities agricultural refillers will require smaller pad. All aerial applicators are assumed to have containment pads of similar size (large), sufficient in width to allow for the entire wingspan of airplanes (plus some margin) to be over the pad area. Ground applicators are assumed to require a medium pad.

4.2.2 Representative Facility and Aggregate Annualized Costs to Agricultural Refillers

Table 4.14 presents the facility-level annualized costs to retrofit existing containment structures among agricultural refiller to comply with the final containment regulations.[46] For secondary liquid containment units, annualized facility-level costs to retrofit are estimated at between $73 for a small-small facility and $87 for a large-small facility. For secondary dry containment units, the annualized facility-level costs are same for all facility size categories at $37.

Aggregate annualized costs are best presented in terms of total industry costs because of differences in the number of facilities that will be affected by the individual rule requirements for existing containers, aggregate annualized costs are best presented in terms of total industry costs (Table 4.12). Facilities may only be subject to portions of a particular standard for existing containment structures. Due to the way we estimate the number of facilities that are subject to the existing containment standards (see Table G.4 for the estimated number of facilities required to retrofit existing containers), we are unable to estimate the extent to which each individual facility will incur multiple compliance costs (capital, initial, O&M, and intermittent) associated with a particular standard. Furthermore, the number of impacted facilities presented in Table G.4 do not reflect any particular facility-size category but the number of impacted facilities in the industry as a whole. To split out the number of impacted facilities by containment standard and size category, we apply the industry-wide percent distribution of small-small, medium-small, large-small, and large facilities for agricultural refillers and the industry-wide percent distribution of small-small, medium-small, and large-small commercial applicators (see Chapter 3).[47] With these considerations in mind, we therefore do not present the total number of aggregated facilities impacted by the standards for existing containment structures. We do, however, present the number of facilities impacted by regulation and compliance cost type in the economic impact analysis presented in Chapter 5. The costs presented in Table 4.12 are calculated by multiplying the annualized cost (presented as total of capital, initial O&M and intermittent in Tables 4.14 and 4.15) with the total number of facilities expected to incur these costs (Table G.4) to arrive at industry level costs.[48] These costs are then distributed by size category based on the industry-wide percent distribution of small-small, medium-small and large-small commercial applicators.[49]

For agricultural refiller facilities that handle bulk liquid pesticides, annualized industry costs are $45,063 across all small-small agricultural refiller facilities, $8,106 across all medium-small

[46] Tables 4.14 and 4.15 present costs calculated using both the 3 percent and the 7 percent discount/interest rate scenarios, respectively. All annual revenue figures are calculated using both a 3 percent and 7 percent discount rate in the discounting procedure and both a 3 percent and 7 percent interest rate in the annualization procedure. When referred to in the text, annual costs will be presented at the 3 percent rate. Appendix B presents the non-discounted facility-level schedule of costs across the 20-year analysis period from which annualized costs are based.

[47] The industry-wide facility size distribution for agricultural refillers is: 83.33 percent small-small, 14.26 percent medium-small, 1.50 percent large-small, and 0.91 percent large. The industry-wide facility size distribution for commercial applicators is: 39 percent small-small, 56 percent medium-small, and 5 percent large-small.

[48] For example, out of the $73 facility level cost for small-small agriculture refillers for secondary liquid containment reported in Table 4.14, $44 is for initial, $24 for O&M and $5 is for intermittent. These are multiplied by the number of facilities expected to incur each of these expenses presented in Table G.4 (333 will incur initial, 1602 O&M and 295 will incur intermittent). To obtain the cost for small-small refillers, each of the cost item was multiplied by 83.33 (see footnote 47) and then these components were added to obtain 45,063 =($44*333+$24*1602+$5*295)*83.33 (components do not add because of rounding).

[49] See footnote 47.

agricultural refiller facilities, $867 across all large-small agricultural refiller facilities, and $529 across all large agricultural refiller facilities. Across all medium-small, large-small, and large agricultural refiller facilities that handle liquid and dry bulk pesticides, annualized costs are $264, $28, and $17, respectively. Annualized costs to retrofit containment pads are $58,372 across all small-small agricultural refiller facilities, $12,719 across all medium-small agricultural refiller facilities, $2,043 across all large-small agricultural refiller facilities, and $1,246 across all large agricultural refiller facilities. Annualized costs to anchor bulk containers are $91,739 across all small-small agricultural refiller facilities, $15,698 across all medium-small agricultural refiller facilities, $1,645 across all large-small agricultural refiller facilities, and $1,003 across all large agricultural refiller facilities. (See Table 4.12.)

Aggregate industry costs incurred to retrofit existing containment structures and anchor bulk containers at agricultural refiller facilities are estimated to be $195,174 across all small-small facilities, $36,787 across all medium-small facilities, $4,584 across all large-small facilities, and $2,794 across all large facilities. Aggregate industry costs among agricultural refillers to retrofit existing containment structures are estimated at $0.25 million on an annualized basis. The breakdown by category of structure estimated at $0.06 million for refiller facilities with liquid bulk storage, $0.0003 million for refiller facilities with liquid and dry bulk storage, $0.07 million for containment pads, and $0.11 million for anchoring liquid bulk containers. (See Table 4.12.)[50]

[50] The numbers are rounded off from the tables for the text. For example, the aggregate industry cost to retrofit existing containment structures is $245,126 in Table 4.12, which is rounded off to $0.25 million in the text.

Table 4.12. Summary of Aggregate Industry Annualized Costs (2005$) [a] to Retrofit Existing Secondary Containment Units and Pads and Liquid Bulk Containers for Representative Agricultural Refillers and Commercial Applicator Facilities, 3% Discount Rate

Item	Small-Small Facilities	Medium-Small Facilities	Large-Small Facilities	Large Facilities	Total
AGRICULTURAL REFILLERS					
Secondary Liquid Containment Industry annualized costs for facilities	45,063	8,106	867	529	54,565
Secondary Dry Containment [b] Industry annualized costs for facilities	na	264	28	17	309
Containment Pads Industry annualized costs for facilities	58,372	12,719	2,043	1,246	74,380
Bulk Liquid Containers (Anchoring) Industry annualized costs for facilities	91,739	15,698	1,645	1,003	110,085
AGRICULTURAL REFILLERS INDUSTRY TOTAL	195,174	36,787	4,584	2,794	239,339
COMMERCIAL APPLICATORS					
Secondary Liquid Containment Industry annualized costs for facilities	704	1,011	90	na	1,805
Containment Pads Industry annualized costs for facilities	944	1,672	222	na	2,838
Bulk Liquid Containers (Anchoring) Industry annualized costs for facilities	446	641	57	na	1,144
COMMERCIAL APPLICATORS, INDUSTRY TOTAL	2,094	3,324	369	na	5,787
ALL REFILLERS & APPLICATORS, COMBINED INDUSTRY TOTAL (Retrofit Existing Structures)	**197,268**	**40,111**	**4,953**	**2,794**	**245,126**

[a] Represents an aggregation of all relevant annualized costs per facility adjusted against the estimated number of affected facilities. The information that feeds into these calculations (number of affected facilities; annualized costs/facility; subtotal, aggregate cost) is derived from Table G.4 and Table 4.14 and the percentage of facilities by size class. The industry-wide facility size distribution for agricultural refillers is: 83.33 percent small-small, 14.26 percent medium-small, 1.50 percent large-small, and 0.91 percent large. The industry-wide facility size distribution for commercial applicators is: 39 percent small-small, 56 percent medium-small, and 5 percent large-small

[b] All bulk dry storage containers are assumed to be located at medium-small, large-small, and large facilities.

4.2.3 Representative Facility Costs (Non-Discounted) for Commercial Applicators

This section presents capital, O&M, and intermittent costs incurred by applicators that must retrofit existing containment structures and bulk storage containers of bulk liquid and dry pesticides. Costs associated with meeting the critical standards are estimated for all independent commercial applicators combined, both aerial and ground applicators. Aerial and ground applicators are assumed to have only bulk liquid storage, with no costs attributable to the containment of bulk dry containers. It is assumed that all facilities meet the containment capacity requirement, and that commercial applicators with existing containment structures are located in states with containment regulations.

Costs (non-discounted) calculated at the facility level for representative firms are aggregated in Appendix H (Tables H.11–H.13). All final costs are in 2005 dollars based on reported trends in the Consumer Price Index (U.S. Department of Labor, 2005).[51] Appendix B presents the non-discounted facility-level schedule of costs across the 20-year analysis period from which annualized costs are based.

Table 4.13. Summary of Aggregate Industry Annualized Costs (2005$) [a] to Retrofit Existing Secondary Containment Units and Pads and Liquid Bulk Containers for Representative Agricultural Refillers and Commercial Applicator Facilities, 7% Discount Rate

Item	Small-Small Facilities	Medium-Small Facilities	Large-Small Facilities	Large Facilities	Total
AGRICULTURAL REFILLERS					
Secondary Liquid Containment Industry annualized costs for facilities	44,052	7,873	840	512	53,278
Secondary Dry Containment [b] Industry annualized costs for facilities	na	235	25	15	275
Containment Pads Industry annualized costs for facilities	61,312	13,747	2,296	1,400	78,754
Bulk Liquid Containers (Anchoring) Industry annualized costs for facilities	85,343	14,603	1,531	933	102,410
Agricultural Refillers Industry Total	190,706	36,458	4,692	2,860	234,717
COMMERCIAL APPLICATORS					
Secondary Liquid Containment Industry annualized costs for facilities	670	962	86	na	1,718
Containment Pads Industry annualized costs for facilities	975	1,782	247	na	3,003
Bulk Liquid Containers Industry annualized costs for facilities	416	597	53	na	1,067
Commercial Applicators, Industry Total	2,061	3,341	386	na	5,788
ALL REFILLERS & APPLICATORS, COMBINED INDUSTRY TOTAL (Retrofit Existing Structures)	192,768	39,800	5,077	2,860	240,505

[a] Represents an aggregation of all relevant annualized costs per facility adjusted against the estimated number of affected facilities. The information that feeds into these calculations (number of affected facilities; annualized costs/facility; and subtotal, aggregate cost) are derived from Table G.4, Table 4.15 and the industry-wide facility size distribution for agricultural refillers (83.33 percent small-small, 14.26 percent medium-small, 1.50 percent large-small, and 0.91 percent large) and the industry-wide facility size distribution for commercial applicators (39 percent small-small, 56 percent medium-small, and 5 percent large-small).

[b] All bulk dry storage containers are assumed to be located at medium-small, large-small, and large facilities.

[51] Note: All annual revenue figures are calculated using both a 3 percent and 7 percent discount rate in the discounting procedure and both a 3 percent and 7 percent interest rate in the annualization procedure. When referred to in the text, annual costs will be presented at the 3 percent rate.

Existing Secondary Containment Structures. Actions required to retrofit secondary containment units for bulk liquid storage containers at commercial applicator facilities are similar to those incurred by agricultural refillers: seal floor drains or discharge outlets; anchor bulk tanks; repair cracks, gaps, and seams; and inspect facilities. Initial estimated costs to seal floor drains are $740 for all facility sizes (Table 4.11). Intermittent costs will be incurred to repair cracks in the structure, on average, every 5 years (Table H.11); repair costs are between $40 for a small-small facility and $140 for a large-small facility. Annual O&M costs to maintain monthly inspections and other recordkeeping requirements are estimated at $30 per facility. (See Table 4.11).

Existing Containment Pads. Table 4.11 presents the potential costs for facilities to comply with EPA's critical standards for existing containment pads. The costs of large containment pads are relevant only to aerial applicators, given that the pads are required to accommodate airplanes. Large-small ground (land) applicator businesses are assumed to require a medium pad. Costs to retrofit containment pads include adding a sump; sealing all drains; repairing all cracks, gaps, and seams; and making monthly inspections (Table H.12).

All commercial applicators are assumed to be located in regulated states. Therefore, these facilities already must meet requirements to seal cracks in the containment pad, and no additional compliance costs for sealing are incurred. Sump (capital) costs are estimated at between $1,660 for small-small commercial applicator facilities and $4,870 for large-small commercial applicator facilities. Drains or discharge outlets (initial costs) in containment pads must be sealed at a cost of $80 per pad. Intermittent repair costs (repairing all cracks, gaps, and seams) are estimated at between $30 for a small-small facility and $70 for a large-small facility. Monthly inspections and written records of inspections and related maintenance (O&M costs) are estimated at $30 per facility. (See Table 4.11.)

Existing Bulk Storage Containers. Facility-level costs to retrofit bulk containers at agricultural facilities apply equally to commercial applicators, and include the cost of anchors and monthly inspection/recordkeeping costs. Anchoring of bulk containers (plastic and steel) is required, costing $580 per container. O&M costs for monthly inspections and recordkeeping are estimated at $30 per container. (See Table 4.11.)

4.2.4 Representative Facility and Aggregate Annualized Costs to Commercial Applicators

Table 4.14 presents the aggregated annualized costs to retrofit existing containment structures among independent commercial applicators to comply with the final containment regulations.[52] For secondary liquid containment units, annualized facility-level costs to retrofit are estimated at between $73 for a small-small facility and $87 for a large-small facility. Facilities that require a medium containment pad (ground applicators) will incur annualized costs of $189 per facility;

[52] Tables 4.14 and 4.15 present costs calculated using both the 3 percent and the 7 percent discount/interest rate scenarios, respectively. All annual revenue figures are calculated using both a 3 percent and 7 percent discount rate in the discounting procedure and both a 3 percent and 7 percent interest rate in the annualization procedure. When referred to in the text, annual costs will be presented at the 3 percent rate. Appendix B presents the non-discounted facility-level schedule of costs across the 20-year analysis period from which annualized costs are based.

and facilities that require a large containment pad (aerial applicators) will incur annualized costs of $329 per facility. (See Table 4.14 for facility-level annualized costs.)

Table 4.14. Summary of facility-level annualized costs to comply with containment regulations representative by facility size for agricultural refillers and commercial aerial and ground applicators to retrofit existing secondary containment units and pads, and liquid bulk containers (2005$), 3% discount rate

Retrofit Item	Small-Small Facility	Medium-Small Facility	Large-Small Facility	Large Facility
Agricultural Refillers				
Secondary Liquid Containment	73	83	87	87
Secondary Dry Containment	n/a	37	37	37
All Applicators				
Secondary Liquid Containment	73	83	87	n/a
Agricultural Refillers and All Applicators				
Containment Pads	132	189	329	329
Bulk Liquid Containers [a]	58	58	58	58

[a] One plastic or steel flat-bottomed bulk storage container is assumed per facility.

Table 4.15. Summary of facility-level annualized costs to comply with containment regulations representative by facility size for agricultural refillers and commercial aerial and ground applicators to retrofit existing secondary containment units and pads, and liquid bulk containers (2005$), 7% discount rate

Retrofit Item	Small-Small Facility	Medium-Small Facility	Large-Small Facility	Large Facility
Agricultural Refillers				
Secondary Liquid Containment	79	87	90	90
Secondary Dry Containment	n/a	32	32	32
All Applicators				
Secondary Liquid Containment	79	87	90	0
Agricultural Refillers and All Applicators				
Containment Pads	150	218	386	386
Bulk Liquid Containers [a]	63	63	63	63

[a] One plastic or steel flat-bottomed bulk storage container is assumed per facility.

Aggregate annualized costs are best presented in terms of total industry costs because of differences in the number of facilities that will be affected by the individual rule requirements for existing containers (Table 4.12).[53] For applicators that need to retrofit existing bulk liquid

[53] Facilities may only be subject to portions of a particular standard for existing containment structures. Due to the way we estimate the number of facilities that are subject to the existing containment standards (see Table G.4 for the estimated number of facilities required to retrofit existing containers), we are unable to estimate the extent to which each individual facility will incur multiple compliance costs (capital, initial, O&M, and intermittent) associated with a particular standard. Furthermore, the number of impacted facilities presented in Table G.4 does not reflect any particular facility-size category but the number of impacted facilities in the industry as a whole. To split out the number of impacted facilities by containment standard by size category, we apply the industry-wide percent distribution of small-small, medium-small, large-small, and large facilities for agricultural refillers and the industry-

secondary units, annualized industry costs are $704 across all small-small facilities, $1,011 across all medium-small facilities, and $90 across all large-small facilities.[54] The estimated costs to retrofit containment pads are $944 annually across all small-small facilities, $1,672 across all medium-small facilities, and $222 across all large-small facilities. The estimated costs to anchor existing bulk containers are $446 across all small-small facilities, $641 across all medium-small facilities, and $57 across all large-small facilities. (See Table 4.12.)

For commercial aerial and ground applicators, the aggregate industry cost to retrofit existing containment structures is estimated at $0.006 million on an annualized basis. The breakdown in estimated costs by category of facility is estimated at $0.002 million for applicator facilities with secondary liquid containment, $0.003 million for containment pads, and $0.001 million for anchoring of liquid bulk containers.[55] The breakdown in estimated costs by facility size is estimated at $0.002 million for small-small applicators, $0.003 million for medium-small applicators, and $0.0004 million for large-small applicators. (See Table 4.12.)

4.2.5 Uncertainty of Cost Estimates

Many of the assumptions present in the compliance cost analysis discussion are inherently uncertain, though every effort has been made to use the best available data to inform our assumptions. Despite efforts to minimize the uncertainty, the sensitivity of certain key inputs and assumptions are discussed in this section based on the magnitude of the impact on the total regulatory compliance costs estimated.

The total compliance cost estimate varies considerably based on assumptions used for estimating the number of regulated entities affected and the unit cost of each regulatory requirement. For example, in this analysis we have assumed that 100 percent of facilities in the states that have regulations for bulk storage have secondary containment units and that 40 percent of facilities in the unregulated states have secondary containment. Similarly, we assume that 100 percent of facilities in states with mixing/loading or operational pad regulations meet EPA's containment pad requirements and that 25 percent of facilities in other states have a pad. Further, as discussed in detail in the sections above, we make additional assumptions about the percent of facilities that might be affected by the EPA's containment regulations to retrofit existing containment structures and to install new units and pads (see Tables G.3 and G.4). Even though, these assumptions are based on inputs from various states, and have been the basis of the economic analysis in the proposed containment rule economic impact analysis, it is possible that these percentages can be somewhat different from our assumptions. We expect that there is less uncertainty about our assumption that 100 percent of all facilities in regulated states will be in

---

wide percent distribution of small-small, medium-small, and large-small commercial applicators (see Chapter 3). With these considerations in mind, we therefore do not present the total number of aggregated facilities impacted by the standards for existing containment structures. The costs presented in Table 4.12 are calculated by multiplying the annualized cost (capital, initial O&M and intermittent) with the total number of facilities expected to incur these costs (Table 3.2) to arrive at industry level costs. These costs are then distributed by size category based on the industry-wide percent distribution of small-small, medium-small and large-small commercial applicators. We do, however, present the number of facilities impacted by regulation and compliance cost type in the economic impact analysis presented in Chapter 5 (Table I.3).

[54] The annualized industry costs are calculated similar to the process described in section 4.2.2.

[55] The numbers are rounded off from the tables for the text. For example, the aggregate industry costs to retrofit existing containment structures is $245,915 in Table 4.12, which is rounded off to $0.25 million in the text.

compliance. The estimates of the number of facilities that are in compliance, on the other hand, may be either 5 percent greater or smaller which should not affect our cost estimates significantly.

Another source of uncertainty is our assumption that 90 percent of all bulk facilities store in undivided quantities greater than 500 gallons and are therefore regulated. We have verified this assumption by contacting several state-level government and agricultural extension staff. However, it is possible that this percentage varies across different states, which might affect the total cost estimates.

4.2.6 Total Aggregate Annualized Costs

The total estimated aggregate annualized costs to retrofit existing containment structures for all agricultural refillers and commercial applicators is $0.25 million (Table 4.12). Given that there are significantly more agricultural refiller facilities affected by the containment regulations, more than 95 percent (or $0.24 million) of the total cost of retrofitting existing containment structures is incurred by agricultural refillers. The breakdown in estimated costs by facility size is $0.20 million for small-small facilities (agricultural refillers account for 99 percent), $0.04 for medium-small facilities (agricultural refillers account for 92 percent), $0.005 million for large-small facilities (agricultural refillers account for 93 percent), and $0.003 million for large facilities (agricultural refillers account for 100 percent—there are assumed to be no large commercial applicators in this analysis). (See Table 4.12.)

In summary, this chapter has presented all of the estimated facility-level costs of compliance with the final pesticide bulk containment regulations for agricultural refillers and commercial applicators. Building on the estimates of facility compliance with the final containment regulations presented in Chapter 3 for new and existing facilities with bulk containment, Chapter 4 presented, by facility size for agricultural refillers and commercial applicators, the unit costs of compliance for new and existing liquid and dry secondary containment units and containment pads; and the discounted and annualized cost of compliance for new and existing containment structures. The estimated aggregate industry costs of compliance were also presented for agricultural refillers and commercial applicators to install new containment units and pads, and to retrofit existing containment units and pads. The next chapter, Chapter 5, presents the total estimated annualized industry costs of compliance, along with a comparison of the estimated costs of compliance with the final containment regulations and the proposed regulations.

5.0 Industry and State Impact Analysis

Chapter 4 presented the facility-level costs of compliance with the final containment regulations for agricultural refillers and commercial applicators. This chapter presents the total costs of compliance with the final containment regulations, which are simply an aggregation of the compliance costs presented in Chapter 4. The chapter also compares the estimated economic impacts (i.e., costs of compliance) of both the proposed and final containment regulations and presents additional analyses of the costs of compliance to agricultural and commercial applicator businesses.

The first section (Section 5.1) describes the results of the facility-level cost analysis developed in the previous chapter and compares economic impacts under the proposed and the final rules. Section 5.2 provides an economic impact assessment of the pesticide containment regulations, measured in terms of compliance costs as a share of facility revenue.

5.1 Aggregate Compliance Costs of Regulations

This section presents the results of the facility-level cost analysis in terms of aggregate (annualized) industry costs to construct new containment structures and to retrofit existing containment structures under EPA's final pesticide containment standards.

5.1.1 Aggregate Annualized Costs under the Final Regulations

From the core facility-level cost analysis developed for this economic analysis (presented in Chapter 4), we can determine aggregate industry costs. Total industry regulatory costs are calculated from estimated annualized costs per facility multiplied by the number of affected facilities with bulk pesticide storage in the agricultural refiller and commercial applicator industries. Industry costs are estimated across all facilities with bulk pesticide storage that will be required either to install new containment structures (new facilities and facilities without secondary containment units and containment pads) or to retrofit existing containment structures (facilities with containment structures that do not meet EPA's critical standards). Tables 5.1 and 5.2 present the total compliance costs to agricultural refillers and to commercial (for-hire) aerial and ground applicators under EPA's final pesticide containment rule. This analysis of compliance costs considers two discount/interest rate scenarios: a 3 percent scenario and a 7 percent scenario.[56] Where applicable, all discounted and annualized costs are presented using the 3 percent rate.

The final rule defines *existing* containment structures as those for which "installation" began on or before 3 months after the date of publication of the final rule in the *Federal Register*. The "beginning of installation" is defined as: the owner or operator has obtained all federal, state, and local approvals or permits necessary to begin physical construction of the containment structure, and either

[56] Note: All annual revenue figures are calculated using both a 3 percent and 7 percent discount rate in the discounting procedure and both a 3 percent and 7 percent interest rate in the annualization procedure. When referred to in the text, annual costs will be presented at the 3 percent rate.

Table 5.1. Annualized Industry Costs of Compliance Under EPA's Final Rule (2005$), 3% Discount Rate

Industry Annualized Costs	Agricultural Refillers (Refilling Establishments)					For-Hire Commercial Applicators (Aerial and Ground)				TOTAL	Percent of Total
	Small-Small Facilities	Medium-Small Facilities	Large-Small Facilities	Large Facilities	Subtotal	Small-Small Facilities	Medium-Small Facilities	Large-Small Facilities	Subtotal		
Construction of New Containment Structures											
Outdoor liquid bulk storage (secondary containment + pads)	687,138	144,797	28,991	17,673	878,599	45,594	70,815	30,263	146,673	1,025,272	35.0%
Outdoor liquid bulk storage (containment pads only)	266,845	45,660	10,173	6,201	328,879	na	44,721	28,457	73,178	402,057	13.7%
Outdoor liquid & dry bulk storage (secondary containment + pads)	na	76,158	33,882	33,882	143,922	na	na	na	na	143,922	4.9%
Indoor liquid bulk storage (secondary containment + pads)	198,559	39,381	7,070	4,310	249,320	na	na	na	na	249,320	8.5%
Indoor liquid bulk storage (containment pads only)	95,258	16,300	3,538	2,157	117,253	na	na	na	na	117,253	4.0%
Outdoor liquid non-bulk storage (containment pads only)	749,049	na	na	na	749,049	na	na	na	na	749,049	25.5%
Subtotal	**1,996,849**	**322,296**	**83,654**	**64,224**	**2,467,023**	**45,594**	**115,536**	**58,720**	**219,850**	**2,686,874**	**91.6%**
Retrofitting of Existing Containment Structures											
Secondary containment, bulk liquid storage containers	45,063	8,106	867	529	54,565	704	1,011	90	1,805	56,370	1.9%
Secondary containment, bulk dry storage containers	na	264	28	17	309	na	na	na	na	309	0.0%
Containment pads	58,372	12,719	2,043	1,246	74,380	944	1,672	222	2,838	77,218	2.6%
Bulk storage pesticide containers	91,739	15,698	1,645	1,003	110,085	446	641	57	1,144	111,229	3.8%
Subtotal	**195,174**	**36,787**	**4,584**	**2,794**	**239,339**	**2,094**	**3,324**	**369**	**5,787**	**245,126**	**8.4%**
Total Industry Annualized Costs	**2,192,023**	**359,083**	**88,238**	**67,018**	**2,706,362**	**47,688**	**118,860**	**59,089**	**225,637**	**2,932,000**	**100.0%**

Source: Tables 4.7, 4.9, and 4.12.

Table 5.2. Annualized Industry Costs of Compliance under EPA's Final Rule (2005$), 7% Discount Rate

Industry Annualized Costs	Agricultural Refillers (Refilling Establishments)					For-Hire Commercial Applicators (Aerial and Ground)				TOTAL	Percent of Total
	Small-Small Facilities	Medium-Small Facilities	Large-Small Facilities	Large Facilities	Subtotal	Small-Small Facilities	Medium-Small Facilities	Large-Small Facilities	Subtotal		
Construction of New Containment Structures											
Outdoor liquid bulk storage (secondary containment + pads)	671,837	143,322	29,015	17,688	861,863	45,370	70,645	30,238	146,253	1,008,116	34.8%
Outdoor liquid bulk storage (containment pads only)	263,105	45,020	10,317	6,289	324,731	na	44,736	28,595	73,331	398,062	13.7%
Outdoor liquid & dry bulk storage (secondary containment + pads)	na	75,404	33,910	33,910	143,224	na	na	na	na	143,224	4.9%
Indoor liquid bulk storage (secondary containment + pads)	196,939	38,645	7,190	4,383	247,158	na	na	na	na	247,158	8.5%
Indoor liquid bulk storage (containment pads only)	99,169	16,969	3,849	2,346	122,332	na	na	na	na	122,332	4.2%
Outdoor liquid non-bulk storage (containment pads only)	738,552	na	na	na	738,552	na	na	na	na	738,552	25.5%
Subtotal	1,969,603	319,360	84,280	64,617	2,437,860	45,370	115,381	58,832	219,584	2,657,444	91.7%
Retrofitting of Existing Containment Structures											
Secondary containment, bulk liquid storage containers	44,052	7,873	840	512	53,278	670	962	86	1,718	54,996	1.9%
Secondary containment, bulk dry storage containers	na	235	25	15	275	na	na	na	na	275	0.0%
Containment pads	61,312	13,747	2,296	1,400	78,754	975	1,782	247	3,003	81,757	2.8%
Bulk storage pesticide containers	85,343	14,603	1,531	933	102,410	416	597	53	1,067	103,476	3.6%
Subtotal	190,706	36,458	4,692	2,860	234,717	2,061	3,341	386	5,788	240,505	8.3%
Total Industry Annualized Costs	2,160,309	355,819	88,972	67,477	2,672,576	47,431	118,722	59,218	225,372	2,897,948	100.0%

Source: Tables 4.8, 4.10, 4.13.

continuous on-site physical construction has begun, or contractual obligations for construction are in effect and cannot be canceled or modified without substantial loss. The rule defines *new* containment structures as those for which installation began more than 3 months after the publication of the final rule. The critical standards apply to existing structures in existing facilities or establishments. If an existing facility or establishment has bulk pesticide storage and no secondary containment structures, the containment unit or pad that must be constructed will be considered "new" and subject to the full federal standards. If a facility or establishment has such minimal secondary containment that the expense of retrofitting to the critical standards would require substantial expense, it is expected that state authorities would recommend or require construction to full federal standards. If major reconstruction is necessary, the incorporation of the additional requirements of the full standards would provide additional environmental protection at minimal additional cost.

Compliance costs for all agricultural refiller and commercial applicator facilities to *construct new* containment structures that meet EPA standards are estimated at $2.69 million (an estimated $2.47 million for agricultural refillers and an estimated $0.22 million for commercial applicators). Compliance costs across both sectors to *retrofit existing* containment structures are estimated at $0.25 million ($0.24 million for agricultural refillers and $0.006 million for commercial applicators). Combined compliance costs (i.e., the compliance cost to install new containment structures plus the cost to retrofit existing containment structures) to all agricultural refiller and commercial applicator facilities under EPA's final pesticide containment standards are estimated at $2.93 million ($2.71 million for agricultural refillers and $0.23 for commercial applicators, as shown in Table 5.1).

These cost figures show that nearly 93 percent of the estimated total industry costs of compliance are expected to be incurred by agricultural refillers, including 92 percent of the cost to install new containment structures and 98 percent of the costs to retrofit existing structures. The remaining costs will be borne by commercial aerial and ground applicators.

Aggregate industry costs incurred to *construct new* containment structures at agricultural refiller facilities are estimated at $2.47 million on an annualized basis (Table 5.1). By facility size, the aggregate industry costs to install new structures are estimated at $2.00 million for small-small businesses, $0.32 million for medium-small facilities, $0.08 million for large-small facilities, and $0.06 million for large agricultural refiller facilities. Aggregate industry costs among agricultural refillers to *retrofit existing* containment structures is estimated at $0.25 million on an annualized basis. The breakdown in costs by facility size is estimated at $0.196 million for small-small refillers, $0.037 million for medium-small refillers, $0.005 million for large-small facility refillers, and $0.003 million for large facilities. (See Table 5.1.)

For commercial aerial and ground applicators, the aggregate industry cost to *install new* containment structures is estimated at $0.22 million on an annualized basis (Table 5.1). Breakdown in costs by facility size is estimated at $0.05 million for small-small applicators, $0.12 million for medium-small applicators, and $0.06 million for large-small applicators.[57] The aggregate industry costs for commercial applicators to *retrofit existing* containment structures are estimated at $0.006 million on an annualized basis. Breakdown in costs by facility size is

[57] In this analysis, it is assumed that there are no large commercial applicators.

estimated at $0.002 million for small-small applicators, $0.003 million for medium-small applicators, and $0.0004 million for large-small applicators. (See Table 5.1.)

5.1.2 Comparison of Aggregate Annualized Costs: Proposed Versus Final Regulations

As discussed in the preceding section, combined compliance costs to all agricultural refillers and commercial applicator facilities under EPA's final pesticide containment standards are estimated at $2.94 million (Table 5.1). This compares to $12.96 million in economic impacts to bulk pesticide storage facilities estimated under EPA's proposed rule,[58] marking a more than two-thirds reduction in regulatory costs under both discount/interest rate scenarios. This reduction in expected costs is attributable to changes in the rule requirements, as recommended by the Agency following a review of the public comments to the proposed rule and further deliberations by EPA. Among these changes are the elimination of the interim period requirements to retrofit existing structures and also elimination of the more costly requirements of the proposed rule, such as the hydraulic conductivity standard and reduction in capacity requirements. The current analysis also extends the time for which costs are calculated; from a 15-year period of analysis to a 20-year period. Due to the discounting and annualization of facility costs, a longer period of analysis results in lower annualized costs.

Table 5.1 and Table 5.3 present the industry costs of compliance for agricultural refillers and commercial applicators under the final and proposed pesticide containment standards, respectively.

Differences between estimated costs of the proposed and final rules are also partially attributable to the fact that more states now regulate pesticide bulk storage facilities. Consequently, fewer facilities located in these states are affected by the final rule. During the early 1990s, 14 states regulated pesticide containment structures, accounting for 71 percent of all agricultural bulk storage facilities. By 1998, 19 states had passed containment regulations and other states had regulations pending, accounting for 85 percent of all bulk storage facilities in the agricultural refiller industry. For this economic analysis, the number of affected facilities excludes those facilities that are assumed to be in compliance with the rule based on their location in states with regulations that meet EPA's requirements for pesticide containment.

Since most facilities with bulk pesticide storage are already covered under state regulations, costs are not assessed for these facilities in this economic analysis. For example, in the analysis for the proposed rule, it was estimated that 765 agricultural refiller facilities would require both secondary containment units and pads and that 562 facilities would need new pads only. For the final rule, it is estimated that 491 refiller facilities would require both units and pads and 343 facilities would require pads only. For commercial applicators, the number of facilities estimated to require construction of new containment units and pads declined from 147 facilities

[58] EPA (1993), inflated to 2005$. The estimated $12.96 million in economic impacts was under Regulatory Option 2 for the proposed rule, which was EPA's recommended option. The requirements of this option are discussed in detail in Chapter 2 and Appendices E and F. Regulatory Option 1 represented the baseline; leaving 40 CFR Part 165 unchanged by retaining the current recommendations for pesticide storage. There were no increased costs estimated for compliance with this option. Regulatory Option 3 represented a higher level of stringency than Option 2. Additional requirements under this option included at each facility a groundwater monitoring system and leachate detection system. The estimated cost of compliance with Regulatory Option 3 was $34.91 million in 2005$.

under the proposed rule to 21 facilities under the final rule, determined from compliance information for agricultural refillers (i.e., approximately 90 percent of all agricultural bulk facilities are assumed in compliance with the secondary containment standards based on the distribution of facilities across states with and without existing regulations). Thus, changes in the estimated size of the affected community have contributed to the differences in total industry costs shown in Tables 5.1 and 5.3. In some cases, these differences reflect shifts between categories of costs to construct new facilities and costs to retrofit existing ones.

Despite the above-mentioned effects of changes in the size of the regulated community on the estimated regulatory costs, changes in the actual regulatory requirements have contributed to the bulk of the reduction in incremental regulatory costs, as discussed in the following sections.

Table 5.3. Annualized Industry Costs of Compliance under EPA's Proposed Regulation

Industry Annualized Costs	Agricultural Refillers (Refilling Establishments)				For-Hire Commercial Applicators (Aerial and Ground)				TOTAL	Percent of Total
	Small Facilities	Medium Facilities	Large Facilities	Subtotal	Small Facilities	Medium Facilities	Large Facilities	Subtotal		
Construct New Containment Structures										
Outdoor liquid bulk storage (secondary containment + pads)	963,585	1,901,136	50,908	2,915,630	202,694	1,076,414	571,079	1,850,187	4,765,816	36.8%
Outdoor liquid bulk storage (containment pads only)	434,728	1,024,600	43,840	1,503,168	0	130,943	86,202	217,144	1,720,312	13.3%
Outdoor liquid & dry bulk storage (secondary containment + pads)	n/a	254,541	392,977	647,518	n/a	n/a	n/a	0	647,518	5.0%
Indoor liquid bulk storage (secondary containment + pads)	274,151	544,389	12,274	830,814	n/a	n/a	n/a	0	830,814	6.4%
Indoor liquid bulk storage (containment pads only)	140,643	304,042	15,655	460,339	n/a	n/a	n/a	0	460,339	3.6%
Outdoor liquid non-bulk storage (containment pads only)	1,281,302	n/a	n/a	1,281,302	n/a	n/a	n/a	0	1,281,302	9.9%
Subtotal	**3,094,409**	**4,028,709**	**515,654**	**7,638,771**	**202,694**	**1,207,356**	**657,280**	**2,067,331**	**9,706,102**	**74.9%**
Retrofit Existing Containment Structures, Interim Period										
Secondary containment, bulk liquid storage containers	29,754	105,021	5,146	139,921	127	1,127	377	1,631	141,552	1.1%
Secondary containment, bulk dry storage containers	n/a	237	647	885	n/a	n/a	n/a	0	885	0.0%
Containment pads	37,575	149,914	6,243	193,731	117	1,370	549	2,037	195,768	1.5%
Bulk storage pesticide containers	20,271	195,898	27,753	243,922	32	2,407	1,427	3,865	247,787	1.9%
Subtotal	**87,600**	**451,070**	**39,790**	**578,459**	**276**	**4,905**	**2,353**	**7,533**	**585,992**	**4.5%**

Table 5.3. Annualized Industry Costs of Compliance under EPA's Proposed Regulation (Continued)

Industry Annualized Costs	Agricultural Refillers (Refilling Establishments)				For-Hire Commercial Applicators (Aerial and Ground)				TOTAL	Percent of Total
	Small Facilities	Medium Facilities	Large Facilities	Subtotal	Small Facilities	Medium Facilities	Large Facilities	Subtotal		
Retrofit Existing Containment Structures, after Interim Period										
Secondary containment, bulk liquid storage containers	70,761	397,488	34,042	502,291	373	4,324	2,376	7,073	509,364	3.9%
Secondary containment, bulk dry storage containers	n/a	9,261	22,243	31,504	n/a	n/a	n/a	0	31,504	0.2%
Containment pads	215,199	1,668,259	69,628	1,953,085	4,206	39,566	13,669	57,441	2,010,526	15.5%
Bulk storage pesticide containers	10,946	90,505	10,861	112,311	48	606	471	1,125	113,436	0.9%
Subtotal	**296,906**	**2,165,513**	**136,773**	**2,599,191**	**4,627**	**44,495**	**16,516**	**65,638**	**2,664,830**	**20.6%**
Total Industry Annualized Costs	**3,478,914**	**6,645,291**	**692,216**	**10,816,421**	**207,598**	**1,256,756**	**676,149**	**2,140,503**	**12,956,924**	**100.0%**

Source: EPA (1993), inflated to 2005$.

5.1.2.1 Costs to Construct New and Retrofit Existing Structures

Under the proposed regulation, nearly 75 percent ($9.7 million) of the estimated industry costs of compliance were expected to be incurred by agricultural refillers and commercial applicators to install new containment structures. The remaining 25 percent of costs ($3.3 million) were expected to cover the retrofitting expenses for existing containment structures. Under the final rule, aggregate costs to install new containment structures constitute 92 percent (or $2.6 million) of the total costs, and costs to retrofit existing structures constitute the remaining 8 percent (or $0.2 million) of total costs. (See Tables 5.1 and 5.3.)

The estimated reduction in retrofitting costs reflects the elimination in the final rule of the interim period requirements and the establishment of critical standards for existing structures. Existing structures that do not meet EPA's critical standards in the final rule will incur retrofitting costs to meet them without an interim period. Still, the requirements under the final rule represent a substantial reduction in compliance costs compared to the proposed regulation, estimated at 75 percent less for facilities with existing containment structures ($3.3 million versus $0.2 million). The major regulatory requirement that contributes to this reduction is the elimination of the hydraulic conductivity standard (and related coating/recoating and recordkeeping requirements). Other changes in the regulatory requirements that contribute to this decline in estimated costs are a reduction in the capacity requirements and elimination of the requirement that containers be elevated to facilitate leak detection. In addition, the requirement in the proposed rule that existing pads be sloped to a sump after the interim period has been removed.

The estimated reduction in construction costs for new secondary containment structures and pads primarily reflects the removal of the coating requirement for floors, pads, and berms required in conjunction with meeting a hydraulic conductivity standard. For outdoor and indoor secondary structures, elimination of this requirement resulted in roughly a 20 percent decrease in all facility-level costs. For pads, removal of all coating costs in the final cost analysis resulted in facility-level costs of one-third less than that estimated under the proposed rule cost analysis. Related contractor and contingency costs, which are calculated as a percentage of total direct costs, as well as additional recordkeeping requirements, also lowered facility-level costs. For agricultural refiller facilities with secondary dry bulk containment, costs estimated for the final analysis were one-third of those estimated for the proposed rule, due to the reduction in the capacity requirements that resulted in a substantial decrease in concrete and berm costs.
For all new containment structures, costs were added in the final analysis to include expenses for the addition of rinsate and precipitation tanks. Although neither the proposed nor the final rule required rinsate tanks, they are recommended as good management practice, and their cost is included. The Agency is not requiring structures to enclose the rinsate tanks.

5.1.2.2 Costs to Agricultural Refillers and Commercial Applicators

Agricultural refillers are expected to incur $2.7 million in regulatory costs to install new and retrofit existing containment structures, constituting the bulk (93 percent) of the total estimated compliance costs under the final rule (Table 5.1). Expressed on a percentage basis, this is a larger proportion of total costs than the distribution observed under the proposed rule, which was estimated at more than $10.8 million (84 percent) of the total industry costs of compliance (Table

5.3). Since several additional operational scenarios are assumed for agricultural refillers based on the types of structures required for bulk pesticide storage, as compared to commercial applicators, the reduction in costs was proportionally greater for agricultural refillers. For example, large cost reductions due to changes in the capacity requirements for dry bulk containment—which are assumed to apply to agricultural refiller facilities only—pushed aggregate costs for agricultural refillers downward. Costs were also lowered due to the removal of the hydraulic conductivity standard and associated coating/recoating requirements. Also, because of proportionately lesser reductions in the rule's pad requirements, which are the major cost component for commercial applicators, costs to individual facilities did not change substantially. Nevertheless, reductions in the regulatory requirements for secondary containment structures and pads lowered overall estimated costs to commercial applicators from $2.1 million under the proposed rule to $0.2 million under the final rule. (See Tables 5.1 and 5.3.)

For agricultural refillers, the costs to construct new secondary containment units and pads in the final rule comprise the bulk of all regulatory costs, estimated at $2.5 million (Table 5.1). Costs to retrofit existing containment structures at agricultural refiller facilities account for a much smaller share of total costs, estimated at $0.24 million (Table 5.1). Compared to estimated costs under the proposed rule (a combined total of $3.2 million for interim and full standards), retrofitting costs are significantly lower (Table 5.3).

Among commercial applicators, costs to retrofit existing structures in the final rule ($0.006 million) comprise a smaller share of the total costs, accounting for approximately 3 percent of total commercial applicator costs to retrofit existing structures under the final rule (Table 5.1). This is less than that estimated for the proposed rule ($0.07 million) (Table 5.3).

In addition to regulatory changes between the proposed containment regulations and the final regulations that lowered costs, the differences in costs between the two analyses are largely attributed to the change in the mix of facilities subject to the containment requirements. The change in the mix of facilities manifests itself in two ways. First, because the final analysis assumes that all facilities in the states with existing bulk pesticide containment programs are in compliance with the final regulations, the actual number of facilities subject to the containment requirements is less for the final regulations than for the proposed regulations. This will, obviously, lead to a reduction in industry-level regulatory compliance costs.

Second, of the facilities included in the current analysis for the final containment regulations, we consider more facilities "small" than in the analysis of the proposed rule. Because costs are less for smaller facilities, a distribution skewed toward smaller facilities will result in lower overall regulatory compliance costs compared to a distribution of facilities skewed toward larger facility sizes. In the proposed rule, the number of containers was split between small, medium, and large size categories with unit costs of compliance calculated based on size assumptions. That analysis assumed that 25 percent of all agricultural refillers were small, 72 percent were medium, and 3 percent were large. For commercial applicators, the proposed rule analysis assumed that 9 percent of applicators were small, 69 percent were medium, and 22 percent were large. In the current analysis, facilities are assigned to small-small, medium-small, large-small, and large facility size categories (only agricultural refillers have "large" facilities; commercial applicators do not). Based on the latest data on the percentage of companies in the different size categories

in the D&B database, we assume that 83 percent of refillers are small-small facilities, 14 percent are medium-small facilities, 2 percent are large-small facilities, and 1 percent are large facilities.[59] For commercial applicators, we assume that 39 percent are small-small facilities, 56 percent are medium-small facilities, and 5 percent are large-small facilities. The larger percentage of facilities in smaller facility size categories results in lower regulatory compliance costs than if those facilities were in larger size categories, since the unit costs of compliance are less for small facilities.

5.1.2.3 Distribution of Costs among Representative Facilities

Across all small-small, medium-small, large-small, and large agricultural refiller and commercial applicator facilities in the final rule, nearly 77 percent of the total industry costs (or $2.23 million) are expected to be incurred by small-small agricultural refiller and commercial applicator facilities. About 16 percent of all costs (or $0.48 million) are estimated to be borne by medium-small firms. Large-small firms are estimated to account for 5 percent of total costs ($0.15 million). Large firms are estimated to account for the remaining 2 percent of all costs ($0.07 million). (See Table 5.1.) In total, these costs are roughly 30 percent of the costs estimated in the cost analysis for the proposed rule: small firms ($3.7 million); medium-sized firms ($7.9 million); and large firms ($1.4 million) (Table 5.3). Because of the different definitions for facility sizes used in each analysis, it is difficult to compare the differences between the two analyses by facility sizes.

5.2 Economic Impacts of the Final Pesticide Containment Regulations

The economic impacts of EPA's containment regulations are estimated at the facility level, in terms of annualized costs as compared to representative facility revenues (as provided in Chapter 3, section 3.3). As evaluated for this economic analysis, it is not expected that a substantial number of small facilities will be significantly impacted by the final containment regulations.

Costs have been assessed at the facility level based on the estimated annualized costs for each representative facility, as presented in Chapter 4. Annualized costs include capital costs and other related operating and management costs, covering the full 20-year period of analysis. To examine the effects of the final rule at the facility level, we compare estimated annualized costs of the rule by representative facility with total facility-level revenue. For purposes of the SBREFA (Small Business Regulatory Enforcement and Fairness Act) analysis,[60] the three sub-categories as defined for the final rule within the "small" size class (i.e., small-small, medium-small, and large-small) were combined into a single "small" size class (as defined by the Small Business Administration) for each regulated entity type (See Appendix I, Tables I.1 - I.4).[61] The estimated impacts are presented for both the general, small facility size class and for each subcategory of small business.

[59] The detailed procedure for assigning facilities to size categories is discussed in Chapter 3 (Table 3.4).
[60] Regulatory Flexibility Act (RFA) as amended by the 1996 SBREFA.
[61] All annual revenue figures are calculated using both a 3 percent and 7 percent discount rate in the discounting procedure and both a 3 percent and 7 percent interest rate in the annualization procedure. When referred to in the text, annual costs will be presented at the 3 percent rate. Tables I.1 and I.3 present costs at the 3 percent rate, and Tables I.2 and I.4 present costs at the 7 percent rate.

Economic impacts are estimated for businesses that will be required either to install new structures or to retrofit existing structures. Tables I.1 and I.2 present the results of the economic analysis and show, respectively, total facility-level annualized costs as a share of current revenues to both install new secondary containment units and pads and to retrofit existing units and pads. A threshold for regulations potentially causing significant impacts to small businesses is an annual cost to revenue ratio of greater than 1 percent. Another consideration is the number of facilities that are affected beyond this threshold. The economic impacts are not expected to be significant if the number of facilities with annual cost to revenue ration greater than the 1 percent threshold is small. Potentially affected industries under the rule include agricultural refillers and commercial applicators with bulk pesticide storage.

To further assist in the examination of small business impacts, Tables I.1 and I.2 present the number of facilities impacted by each containment standard. It should be noted, however, that not all facilities impacted by the same containment standard for existing structures will incur the same costs. As described in Chapter 3, some facilities may only need to comply with portions of a particular standard. For example, because states may already have standards in place that cover one or more of the components of this standard, agricultural refillers subject to the secondary containment standards for existing bulk liquid outdoor storage may be subject to one or all of the standards' components. These include (1) the initial cost of sealing the floor drain or discharge outlet, (2) the operating and maintenance (O&M) cost of recordkeeping and maintenance, and (3) the intermittent cost of repairs.

In the compliance profile (Chapter 3), we estimate the level of compliance by making assumptions about the extent to which facilities with existing secondary containment structures, both within and outside of states with state-level containment regulations, are or are not already in compliance with the national containment standards (see Table G.4). Because these compliance assumptions apply to different facilities, it is impossible to estimate one single, facility-level cost associated with compliance with the containment standards for existing structures. To calculate facility-level economic impacts, however, we make the conservative assumption that the average facility will incur all costs associated with bringing its existing containment structure into compliance with the national standards. Though this is an overestimate of the facility-level compliance costs that most facilities will incur (both refillers and applicators), the impact analysis still reveals that the overall economic impacts of the existing containment structure standards are less than 0.28 percent of revenues for all size categories (Table I.3).

5.2.1 Facility-Level Impacts for Agricultural Refiller Facilities

This section describes estimated facility-level economic impacts for agricultural refillers that install new containment structures or retrofit existing structures. Facility-level impacts are assessed in terms of annualized costs as compared to facility-level revenue.

Under the containment rule, some facilities with bulk pesticide storage will incur costs to install a new secondary containment unit and a containment pad. Table I.1 compares the total facility annualized costs with the facility's revenue, and indicates that representative agricultural refiller facilities will not be adversely impacted by the final containment regulations.

Across all small facilities (small-small, medium-small, and large-small), the economic impacts of installing a new secondary containment unit and pad are estimated to be small, with estimated annualized costs for secondary containment accounting for no more than 0.14 percent of revenues. Total facility impacts to install only a containment pad are similar across each bulk pesticide storage facility type; only small facilities with non-bulk activities have a higher compliance cost to revenue ratio (0.18 percent). For small-small agricultural refillers, estimated annualized costs for new secondary containment structures account for no more than 0.34 percent of revenue across all bulk storage facility types. Economic impacts on medium-small, large-small, and large facilities are also not significant, with annual cost to revenue ratios estimated at no more than 0.07 percent for both discount/interest rate scenarios. (See Table I.1.)

Table I.3 compares facility revenues to the maximum potential facility-level annualized costs to retrofit existing secondary containment units and pads. The results of this analysis indicate that agricultural refiller facilities with existing structures will not incur significant adverse economic impacts in complying with EPA's critical standards. A small agricultural refiller facility with both types of containment structures and one bulk storage container is estimated to incur annualized compliance costs under 0.02 percent of total revenue. All other small facility types (i.e., bulk liquid storage, bulk dry storage, containment pad only, or bulk liquid container) have even smaller compliance cost to revenue ratios. Small-small facilities face estimated compliance costs that are less than 0.04 percent of revenues. Medium-small, large-small, and large facilities have higher annual costs but estimated lower economic impacts due to larger revenues. (See Table I.3.)

As mentioned above, a threshold for regulations potentially causing significant impacts to small businesses is an annual cost to revenue ratio of greater than 1 percent. Based on this we find that the impact of containment regulations on agriculture refiller facilities is not significant.

5.2.2 Facility-Level Impacts for Commercial Applicator Businesses

This section describes estimated facility-level economic impacts at commercial (for-hire) aerial and ground applicator businesses needing to install new containment structures or retrofit existing structures. Facility-level impacts are assessed in terms of annualized compliance costs as compared to current facility-level revenue.

Estimated facility-level economic impacts to install secondary containment structures at representative small (including small-small, medium-small, and large-small) for-hire applicator businesses with bulk pesticide storage are shown in Table I.1. The combined effects on aerial applicator facilities that require construction of both a secondary containment unit and pad, as well as those facilities that require a new pad only, indicate that small representative facilities may experience economic impacts larger than those experienced by agricultural refillers. Small aerial applicators requiring both a secondary containment unit and pad have an estimated annual cost to revenue ratio of 2.7 percent (Table I.1). This is greater than the 1 percent threshold; however, only an estimated 16 facilities (six small-small facilities, nine medium-small facilities, and one large-small facility)—out of a total of 160 aerial applicator facilities with bulk storage—are likely to face this level of impact. For small-small facilities the annual cost to revenue ratio is estimated to be higher than the general small facility category, at 7.8 percent, while medium-small and large-small aerial facilities needing both a secondary containment unit and pad have an

annual cost to revenue ratio that is lower, 2.1 percent and 1.3 percent, respectively. (See Table I.1.) Even though this is greater than the 1 percent threshold, the overall impact is not expected to be significant because only six facilities will be affected.

Small aerial applicator facilities requiring only a containment pad have an estimated annual cost to revenue ratio of 1.25 percent, which is again greater than the threshold of 1 percent for regulations potentially causing significant impacts to small businesses. An estimated 10 facilities (seven medium-small facilities and three large-small facilities)—out of a total of 160 aerial applicator facilities with bulk storage—could face this level of impact. Using the alternative definition of small business, medium-small facilities and large-small facilities needing just a containment pad[62] have estimated annualized costs of 1.63 percent and 0.81 percent of revenues, respectively. (See Table I.1.)

Table I.3 presents the aggregate facility-level impacts to retrofit existing secondary containment units and pads at commercial applicator facilities. As shown, commercial applicators with existing structures are not expected to be significantly affected by the rule requirements to retrofit existing structures. Across all small applicators required to retrofit existing containment, aggregate annualized costs are estimated to be 0.11 percent of current annual revenues. Aggregate annualized costs to small-small aerial applicators with existing containment are estimated to account for 0.28 of revenues, while medium-small and large-small aerial applicators have annualized costs estimated less than 0.09 percent of revenues. Large-small ground applicators with existing structures are estimated to have annual cost to revenue ratios below 0.06 percent. (See Table I.3.)

In summary, the number of small businesses significantly impacted by the final containment regulations is not expected to be substantial for agricultural refillers. The facility-level impact on commercial applicators is significant; however, only a small number of facilities is likely to be affected. Measured in terms of a ratio between the annualized cost of compliance with the final regulations to current annual revenues (i.e., annual cost to revenue ratio), the impacts to small agricultural refiller facilities to install new containment structures and to retrofit existing structures is less than 0.3 percent for all small facilities, which is less than the threshold of 1 percent for regulations potentially causing significant impacts to small businesses. For small commercial aerial applicator facilities, 26 facilities (out of a total of 160 facilities with bulk pesticide storage) may face cost to revenue ratios of more than 1 percent to install new containment structures. The cost to revenue ratio for small aerial applicators to retrofit existing structures is less than 0.3 percent for all small facilities. The cost to revenue ratio for ground applicator facilities to install new containment structures and to retrofit existing structures is less than 1 percent for all small facilities.

The cost analysis presented in Chapters 4 and 5 has shown that the total industry costs of compliance with the final containment regulations are estimated at $2.93 million (Table 5.1), and that the impacts of compliance with the final regulations on small facilities are not expected to be significant (Tables I.1 and I.3). The next and final chapter, Chapter 6, presents the estimated benefits of compliance with the final containment regulations.

[62] It is assumed that only medium-small and large-small aerial facilities are affected by the containment pad requirement; small-small facilities are not expected to engage in activities that require a pad.

5.3 State Level Costs

The burden on the State agencies considered in this analysis is the administrative burden associated with determining whether a State's regulations for bulk pesticide containment structures, if they exist, offer equivalent environmental protection to the federal regulations. If a State has bulk pesticide containment structures regulations, the State may choose to prepare documentation that the State regulations provide environmental protection equivalent to the federal regulations. This is not required, but it is assumed that the 19 States which currently regulate bulk pesticide containment structures will choose to submit the documentation. For these States the following activities would apply: reading the rule instructions, planning activities, gathering and creating information, monitoring and enforcing the regulations, storing and maintaining data, and corresponding with the Agency regarding their regulations. For the remaining 31 States, which do not currently have regulations for bulk pesticide containment structures, only a subset of these activities would apply (i.e., reading the instructions, monitoring and enforcing, and storing and maintaining data), so their burden will be less. The paperwork burden is only expected to occur in the first year of the regulations.

For the 19 States which currently have bulk pesticide containment regulations, it is estimated that nine and one half hours will be spent on information collection activities. At a cost of $43 per hour for state administrative labor [63], the estimated yearly cost for nine and one half hours of time spent on the information collection, per State, is $409.50. The total paperwork burden across all States with bulk pesticide containment regulations, assuming that 19 States currently have regulations, is 180.5 hours. The total cost across all 19 States is an estimated $7,761.50.

The annual burden for the States without bulk pesticide containment regulations is an estimated four hours per state or $172 per state. The total annual paperwork burden across all States, assuming 31 states do not currently have bulk pesticide containment regulations, is 124 hours. The total cost across all 31 States is an estimated $5,332. Including the cost for those 19 States with bulk pesticide containment regulations, the total cost of the paperwork burden is $13,093.50.

[63] Source: US Bureau of Labor Statistics. State and Local Government, by major occupational and industry group. http://www.bls.gov/news.release/ecec.t03.htm

6.0 Benefits of Bulk Pesticide Storage Containment

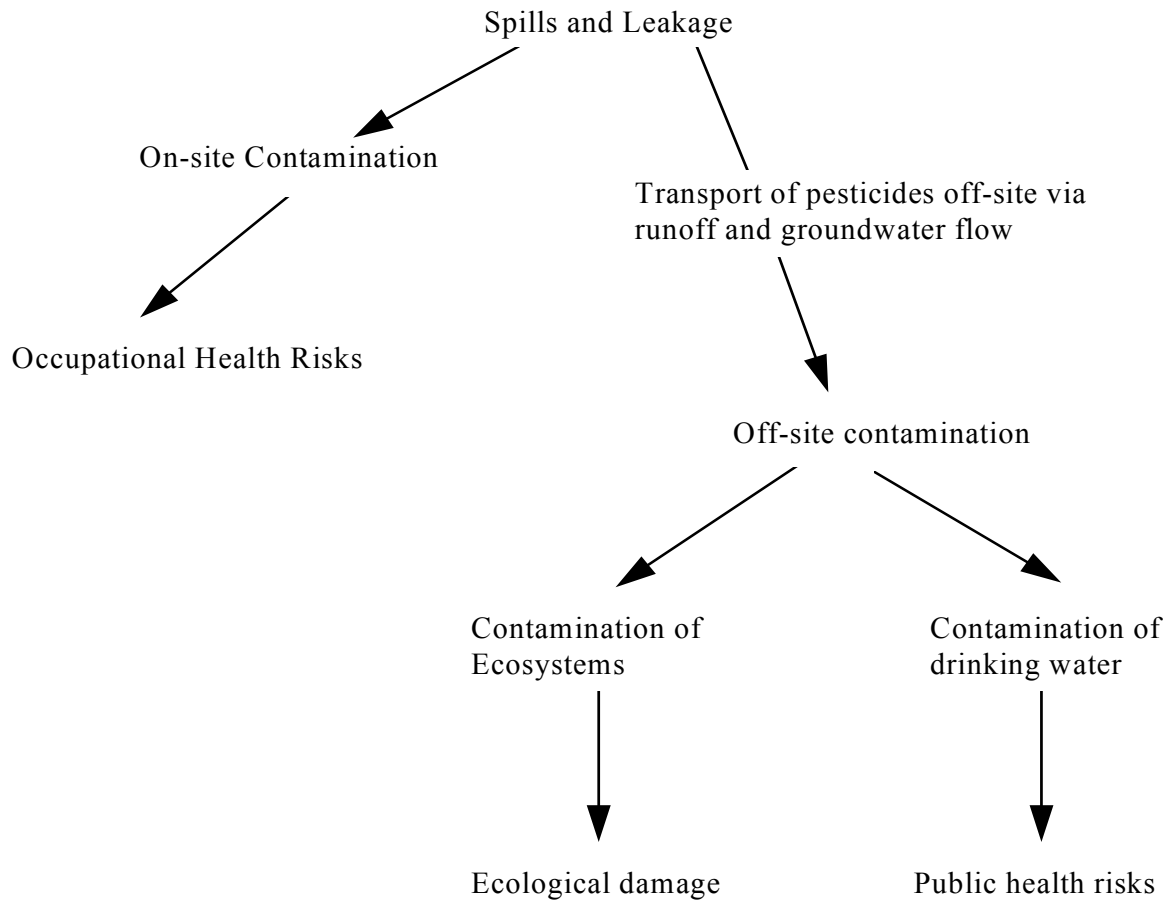
This chapter discusses the human health and environmental benefits estimated to result from fewer uncontrolled releases of pesticides into the environment as a result of the final containment regulations, and the magnitude or value of such benefits. These benefits will include fewer and less severe incidents of damage to natural resources and public and private property, reductions in cleanup and remediation costs, and lower health risks to workers and area residents.

The final standards for containment of pesticides at bulk pesticide storage facilities are intended to prevent pesticide contamination of soil and water resources at facilities where pesticides are stored in bulk containers and facilities where container refilling operations occur. One useful categorization of pesticide contamination resulting from accidental releases at bulk storage facilities is (1) on-site contamination versus (2) off-site contamination. The distinction is useful because on-site and off-site contamination pose different potential risks. On-site contamination poses potential health risks to workers on the site at the time of the release. If the released pesticides are transported off-site via surface runoff or groundwater flow, they can pose health risks to the general population and to ecological systems that are not necessarily in the immediate vicinity of the containment structure. The information and methods necessary to quantify off-site risks are different from those necessary to quantify on-site risks. A flow diagram of the links between accidental releases of pesticides from bulk storage facilities and the different types of risk posed is shown in Figure 6.1.

As in any benefit analysis, the benefits of the pesticide containment rule depend in part on how the baseline scenario (i.e., "the world in the absence of the rule") is defined. This analysis incorporates into the baseline the fact that large accidental releases of pesticides are likely to be followed by remediation efforts. That is, some of the potential human health risk and environmental damage resulting from a spill would be avoided in the baseline scenario, at some remediation cost. If cleanup were complete and instantaneous, then none of the three categories of damages shown in Figure 6.1 would be relevant because none would occur; all that would be relevant to a benefits analysis would be the remediation costs avoided. As discussed more fully below in Section 6.3, however, this is not likely to be the case, nor would it be optimal. The total benefits of the pesticide containment rule are therefore comprised of both the avoided remediation costs and the value of avoiding the human health risks and ecological damages that would occur prior to remediation efforts and/or remain after remediation efforts in the baseline scenario.

A quantitative analysis of the total benefits expected to result from the rule would require a substantial amount of information, beginning with the identification of the specific pesticides accidentally released from such facilities and the human health risks and ecological risks associated with acute and/or chronic exposure to those pesticides. There is currently insufficient information, however, to support such a quantitative analysis of the total benefits of the pesticide containment rule. An analysis of the partial benefits of avoided remediation costs, however, provides lower-bound estimates of benefits. This approach estimates the remediation costs in the baseline scenario (in the absence of the pesticide containment rule) that would be avoided in the control scenario (i.e., with the implementation of the rule).

Figure 6.1. Flow Diagram of Potential Damages from Pesticide Containment Structures



This chapter presents the results of the analysis of partial benefits supported by the available information, as well as an outline of the analysis of total benefits that would be carried out if there were sufficient information. Section 6.1 discusses the types of releases that occur and presents the evidence of these releases. Section 6.2 discusses the valuation of the benefits of the pesticide containment rule and presents the results of an analysis of the partial benefits of avoided remediation costs. Section 6.3 outlines the information necessary to estimate the potential total benefits of a pesticide containment rule. Finally, Sections 6.4 and 6.5 qualitatively discuss the two broad categories of risk shown in Figure 6.1, human health risks and ecological damage, respectively. Human health risks resulting from both on-site occupational exposure and from off-site drinking water exposure are considered jointly.

6.1 Types and Evidence of Spills and Leakage

In general, uncontrolled releases from pesticide bulk storage facilities fall into two categories: (1) infrequent, large-volume accidental releases and (2) chronic, small-volume operational releases (drippage, spillage, and equipment washoff). Although chronic small leaks from bulk containers and appurtenances may often be responsible for environmental contamination, the less frequent, large-volume accidental spills are better documented, perhaps because of existing reporting requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 403, and the Environmental Planning and Community Right-to-Know Act (EPCRA) Section 304.

In its *Federal Register* notice of the proposed rule (59 FR 6712, February 11, 1994), EPA cited the causes of major spills as "(1) bulk container failure (due to structural defects, corrosion of the containers by incompatible pesticides, improper installation, fire, collisions with equipment, etc.), (2) failure of pipes, hoses, valves, or pumps, (3) operator errors (e.g., neglecting to shut off valves, overfilling, leaving transfer operations unattended), and (4) vandalism."

6.1.1 Evidence of the Occurrence of Spills

The evidence of the occurrence of spills, which comes from both federal and state sources, is presented in Table 6.1 below. In some cases the number of incidents during the reporting period is given, but there is insufficient information from which to estimate an annual release probability; in other cases, the estimated frequency per year out of a known number of bulk storage facilities is given, from which annual release probabilities can be derived. Although the available information on the occurrence of spills is undoubtedly incomplete, it provides an indicator of the magnitude of the problem, and is used to estimate the frequency of spills per year, a necessary input to the estimation of avoided remediation costs resulting from the pesticide containment rule (see Section 6.2 below).

Table 6.1. Reported Incidence of Spills from Pesticide Bulk Storage Facilities

Source of Information	Reporting Period	Number of Incidents During the Reporting Period	Estimated Annual Release Probability [a]	Range of Release Quantity	Pesticides Spilled
National Response Center (U.S. Coast Guard)	1982 - 1991	40	---	2 - 1,000 gallons	70% herbicides
Nebraska Dept. of Environmental Control	1981 - 1991	20	---	a few gallons to 1,400 gallons	all herbicides
Wisconsin Dept. of Agriculture, Trade and Consumer Protection	1981 - mid-1984	9	---	a few gallons to 1,700 gallons	---
Michigan Dept. of Natural Resources	1987 - early 1991	15 [b]	4/300 (1.3%)	---	---
MacDonald, 1991	1984 - 1990	---	0.9% of Nebraska's 350 containment sites	---	---
EPA (Howard, 1991)	1986 - 1990	---	1.0 – 1.5%	---	---

[a] The annual release probability is estimated as the number of accidental releases divided by the number of bulk storage facilities.
[b] Estimate based on reported characteristics of incident.

The last three entries in Table 6.1 provide limited information on the frequency of spills from bulk storage facilities. The Michigan Department of Natural Resources (MDNR) Pollution Emergency Alerting System (PEAS) was used to compile a summary of agriculture-related pollution emergency incidents from 1987 through early 1991. This compilation covered incidents pertaining to fertilizers, pesticides, unspecified chemicals, and animal wastes (manure, offal, carcasses, and blood). An inspection of the incidents show that they relate to lawn care, nurseries, and other non-agricultural activities as well as to traditional agriculture. In general, the types of activities covered include application, transportation, and storage.

The MDNR data cover 180 agriculture pollution incidents for the period of 1987 to early 1991. Using a process of elimination that subjectively considers the source, the nature of the complaint, and the volume of material, incidents that suggested a possible major bulk storage or loading release were identified. It was estimated that 15 of the 180 incidents, or 8.3 percent, were related to pesticide storage or loading/refilling releases.

Over the 5-year period, the 15 MDNR agricultural emergency incidents conservatively classified as storage or loading/refilling releases equate to about three to five releases occurring per year from pesticide dealers. Assuming these are primarily from bulk storage or refilling activities, this implies that about one out of every 75 Michigan pesticide dealers experiences an emergency release annually (4 out of 300). Thus, the probability of a release would be about 0.013 (1.3 percent).

EPA obtained similar data for the state of Nebraska (MacDonald, 1991), which indicate that reported storage or refilling spills occurred at the rate of about three per year for the period 1984 through 1990. With an estimated 350 bulk storage and refilling facilities in Nebraska, the resulting spill or leak incidence rate would be 0.9 percent.

These findings are consistent with independent estimates obtained from EPA (Howard, 1991), which solicited spill/leak incidence data from registrants whose products are frequently stored by dealers in bulk. Two registrants provided approximations of the percentage of dealers' bulk storage sites that experience leaks or spills with their products. One registrant estimated that for the period of 1986 through 1990, about 1.5 percent of the sites experienced a leak or spill each year. The other registrant estimated that about 1.0 percent of the sites per year experienced such releases.

While there is general agreement on estimated spill or release frequency from the sources mentioned above, the rate of spills and releases may actually be greater than estimated. Factors such as the following could result in unreported spills and leaks:

- Reporting of incidents involving certain chemicals or spills may not be required by law;
- Facility operators may be unaware of low-volume, chronic leaks, or may not perceive them as spills significant enough to warrant reporting; and
- Facilities may be reluctant to report some incidents due to liability and publicity concerns.

6.1.2 Evidence of On-Site and Off-Site Contamination

Evidence that spills and leakage result in both on-site and off-site contamination comes from several sources. Sources in several states have documented soil, surface water, and groundwater contamination from various operations of agricultural chemical distributors, repackagers, and applicators.

Illinois Department of Health Study. Dr. Thomas Long of the Illinois Department of Health sampled groundwater pesticide contamination in 1987 and 1988 at or adjacent to agricultural pesticide refillers in the state (Long, 1989). The samples showed pesticide residues in groundwater at between 65 and 75 percent of the agricultural pesticide refiller facilities sampled.

Although Dr. Long's research does not identify site-specific sources of this pollution, he points out that it could occur due to "back-siphonage, sloppy mixing and loading procedures, lack of rinsate collection and improper waste disposal..." He also points out that "production wells at facilities are often shallow, improperly constructed or poorly located" with respect to facility activities and implies that wells, too, are part of the problem.

The degree to which pesticide residues in groundwater result in potential human exposure, however, depends on several factors, including the location of point sources in relation to drinking wells and the nature of the wells themselves. Dr. Long (1989) notes that:

> Despite the pesticide and nitrate contamination beneath these facilities, the potential human exposure may be limited or non-existent in many such circumstances. Many of these facilities are isolated, and the wells

are not sources of drinking water. Even when the wells are sources of potable water, they usually do not serve as the sole source of cooking and drinking water for exposed individuals.

In certain instances, however, this groundwater contamination can affect surrounding wells. In a number of small communities, agrichemical mixing and loading facilities are close to homes with private drinking-water wells. Most of these private wells are old, shallow, and poorly constructed. Thus, they are highly susceptible to deterioration due both to surface runoff and groundwater contamination. At least 10 such sites are within a 25-mile radius of Springfield, Illinois.

Illinois Environmental Protection Agency Studies. Similar cases of pesticide groundwater contamination at agricultural pesticide refiller facilities have been documented by A.G. Taylor, Agriculture Advisor for the Illinois Environmental Protection Agency (Taylor, undated), as summarized in Table 6.2. Mr. Taylor's findings were presented as testimony for proposed state regulations regarding pesticide storage and handling. Although the direct cause of contamination in his case studies was usually unknown, the findings indicate that groundwater contamination is associated with the types of facilities that would be subject to regulation.

Iowa. There were similar findings of contamination of public or private drinking water wells located near Iowa farm supply dealerships. Hallber (1986) cites 10 Iowa case studies where pesticide concentrations in groundwater near dealerships were 100-fold or more concentrated than background levels. Further, in Iowa, in more than 80 percent of the instances in which herbicides other than atrazine have been detected in public wells, the wells were located near commercial applicator and agricultural pesticide refillers facilities (Fawcett, 1989).

The Iowa Fertilizer and Chemical Association (IFCA) estimates that approximately 90 percent of the Iowa agricultural chemical dealer sites have some level of detectable environmental contamination and that up to 40 to 50 percent will require some form of eventual remediation. They attribute most of these environmental concerns primarily to "past practices before our investment in dikes and containment." Furthermore, IFCA indicates that containment "is not the total answer, but when combined with other management changes, future contamination can be avoided." IFCA believes that dikes and containment have been installed at over 800 sites but is pressing for legislative action to help finance the cleanup of the environmental contamination that occurred before containment was installed (Frieberg, 1991).

Table 6.2. Pesticides Identified in Wells on or Near Agricultural Facilities in Illinois

Location	Pesticides Detected	Concentration	Well Type	Potential Cause	Detection in Other Nearby Wells (Y = Yes; N = No)
Ag-Pro Chemical Company Woosung, IL Ogle County	Atrazine Alachlor Metolachlor Diazinon Chlorpyrifos	180 ppb 38 ppb 145 ppb 5 ppb 19 ppb	Residential well located near facility	Unknown	Y
Burrough's Trucking Company Rutland, IL LaSalle County	Alachlor	Trace levels	Well located inside fertilizer storage building	Unknown	---
Crop Protection Service [a] Biggsville, IL Henderson County	5 herbicides	Detectable levels	Facility well	Backsiphonage	---
Erie Ag Service Erie, IL Whiteside County	3 herbicides	≥ USEPA health advisory levels	Facility well	Unknown	N
Galesville Chemical Company Galesville, IL Piatt County	Alachlor Atrazine Metolachlor Metribuzin	> 200 ppb	Non-domestic use private well downgradient from facility	Mixing & Loading	N
Kaiser Agricultural Chemical Company Cantrall, IL Sangamon County	Various	Trace levels	Several wells in vicinity of dealership [b]	Unknown	Y
Kaiser Agricultural Chemical Company Oconee, IL Christian County	Various	3.09 ppm	Non-drinking water well facility	Unknown	Y [c]
MDM Fertilizer Sharpsburg, IL Christian County	Various	300 ppb	Facility well	Unknown	Y [d]

Table 6.2. Pesticides Identified in Wells on or Near Agricultural Facilities in Illinois (Continued)

Location	Pesticides Detected	Concentration	Well Type	Potential Cause	Detection in Other Nearby Wells (Y = Yes; N = No)
Montgomery County Service Company Butler, IL Montgomery County	Atrazine Alachlor Metolachlor	21 ppb 12 ppb 54 ppb	Old facility well	Unknown	N [e]
Rusk Spraying Service Kankakee, IL Kankakee County	Alachlor	Trace	Facility well	Mixing/loading operations contaminating soils	---
Sidwell Farm Service Ohlman, IL Montgomery County	4 herbicides	1.1 ppb - 21.0 ppb	Facility well	Unknown	Y [f]
Waller Farm Service Bardolph, IL McDonough County	Alachlor [g]	Trace	Private well on property next to	Chronic spillage and runoff	---
Webb Fertilizer Service, Inc. Fairview, IL Fulton County	Atrazine Metolachlor Cyanazine Alachlor	49 ppb 17 ppb 3.6 ppb 7 ppb	Non-functional facility well	Unknown	N [h]

[a] Extensive soil and surface water contamination also found.
[b] Included one well on elementary school property. The well on-site also contained over 200 ppm nitrates.
[c] Several herbicide chemicals and nitrate-N concentrations exceeding 400 ppm were detected in a private well used by a nearby auto repair shop.
[d] Eleven of 17 wells sampled were contaminated with herbicide chemicals. The highest concentrations analyzed were in samples from the MDM Fertilizer well.
[e] Four residential wells near the facility were tested and no pesticides were detected.
[f] A residence one-half mile from the facility also showed trace levels of herbicides. Wells at three neighboring residences showed trace levels of alachlor, metolachlor, and Malathion.
[g] Surface drainage contained high concentrations of herbicide and fertilizer products.
[h] A private well 100 yards from the facility tested the same day did not contain herbicides.

Michigan. In a 1989 survey, the Michigan Department of Agriculture sampled well water from 50 bulk storage sites of commercial agricultural pesticide refillers. The Department reasoned that the combined conditions of permeable geological strata and intensive handling of pesticides and fertilizers would represent a "worst case scenario for agricultural chemical impacts on groundwater quality." Pesticides were detected and confirmed in well water from eight (16 percent) of the sites (pesticide concentrations in soils were not determined). Health advisory levels for pesticides were exceeded in three (6 percent) of the wells. The draft report concluded that bulk storage operations of agricultural pesticide refillers located on hydrogeologically vulnerable sites pose a threat to groundwater quality (Michigan Department of Agriculture, 1989).

Utah. A study of pesticide dealerships in Utah found pesticide contamination resulting from a variety of handling activities, including spills of pesticides in bulk storage and dispensing operations, mixing and loading of pesticides into application equipment (for dealerships that engaged in custom application), and equipment cleaning activities, among others. The pesticide detections were located in the pesticide handling areas of the facilities as well as off-site in ponded depressions, drainage-ways, gravel driveways, and parking lots (Novak, 1991).

Wisconsin. The Wisconsin Department of Agriculture, Trade, and Consumer Protection (WDATCP) and the Wisconsin Department of Natural Resources (WDNR) jointly investigated 20 Wisconsin facilities to provide more specific information on: sources of pesticide contamination; pesticide concentrations in surface water and groundwater; the total concentration of pesticide compounds in soil; specific compound concentration in the surface soils and multiple soil depth; and pre- and post-investigation concentrations where remediation was implemented. The WDATCP/WDNR study resulted in several general conclusions (Habecker, 1989):

- Contamination comes from a wide range of pesticides, and the level of residues for each type is highly variable.
- Chronic release areas had the highest number of pesticide residue types and greatest ranges of pesticide residue levels found.
- The compounds most frequently found in soils at the sites were alachlor, atrazine, and metolachlor, with 80 percent of the facilities containing all three of these compounds.
- The three most highly contaminated facility areas were acute spill areas, burn areas, and mixing/loading areas.
- Follow-up soil sampling indicated that spillage appears to be an ongoing problem, especially in the mixing/loading and pesticide equipment parking areas.

In 1991, the Wisconsin agencies reported the results of a related environmental survey of 27 randomly selected agricultural pesticide application business sites. (The study was designed to assess operations representative of the industry as a whole, since contamination had not previously been reported at these study sites.) The investigation revealed the presence of pesticides in soil at 25 of the 27 locations. Soil samples from 18 (66 percent) of the sites had concentrations exceeding field application rates, and these facilities may eventually require soil remediation. Pesticides were also found in groundwater at more than half (55 percent) of the

sites; at nine of these locations (33 percent of all sites), groundwater contamination levels were greater than allowed by Wisconsin enforcement standards.

Given these results, the agencies subsequently concluded that between 45 and 75 percent of the state's commercial mix/load sites may need some soil remediation and that 29 to 63 percent potentially exceed the state's groundwater enforcement standard. Many of the latter may also require remediation (Morrison and Kefer, 1991).

Some monitoring programs have found pesticide concentrations in groundwater wells far in excess of state enforcement standards (which are usually based on health and/or ecological effects). For example, alachlor has a state enforcement standard of 0.5 parts per billion (ppb) in Wisconsin, but it was found at levels up to 1,800 ppb at a groundwater supply well (Habecker, 1989). EPA's maximum concentration level for alachlor is 2 ppb (EPA, 2005c). Atrazine, metolachlor, and other pesticides shown in Table 6.2 have also been found at levels exceeding state standards or guidelines. The *National Survey of Pesticides in Groundwater* estimates that approximately 10 percent of the community water system wells in the United States contain one or more pesticides and that 4 percent of the nation's rural domestic wells contain pesticides. It is not known, however, to what extent the presence of pesticides in the wells covered in this survey is due to accepted application practices or to incidents such as spills, leaks, misuse, or improper disposal.

While the data from the various sources cited above are not statistically comparable, they do confirm that pesticide releases and contamination are occurring at agricultural pesticide refiller facilities. In addition, various field contacts and general press reviews suggest that releases from bulk pesticide storage and refilling/repackaging activities are specific problem areas, and containment is perceived as a major deficiency at some operations. Most of these releases may occur from accidents or acts of vandalism and not from deterioration of tanks and equipment (Beal, Ohio Department of Agriculture, 1991; Gingery, Montana Department of Agriculture, 1991; Flowers, Arkansas Plant Board, 1991; Rogers, Mississippi Department of Environmental Quality, 1991; Frank, West Virginia Department of Agriculture, 1991; Uram, Pennsylvania Department of Agriculture, 1991; Chada, Oklahoma Department of Agriculture, 1991). The frequency or magnitude of releases from dispensing/refilling areas is unknown but likely to be on the same order of magnitude as large volume releases from storage facilities. Drippage and other chronic, small-volume releases are likely to occur more frequently for dispensing/refilling areas than for bulk container areas.

An indirect form of evidence for the potential threat of spills and leaks is that major registrants have established safety programs for dealers handling their products in bulk. Syngenta provides price incentives and fire, theft, and pollution insurance for their products if dealers have approved bulk storage and rinsate pad containment. Other companies also operate bulk storage programs for herbicides which require containment for bulk storage containers prior to sales of product to a dealer. Also, the Mid America CropLife Association has developed model bulk pesticide guidelines that recommend containment in both the bulk storage and permanent handling and loading areas.

As additional indirect evidence, 19 states (see Table G.2), most of which are major agricultural states with large numbers of agricultural pesticide refiller facilities (farm supply and fertilizer dealers), have already promulgated regulations for the bulk storage of pesticides. Minnesota is one state that has introduced more stringent bulk pesticide storage rules; however, a 1996 survey found that contamination continues to be a problem (MDA, 1996). In 1989, data concerning pesticide leaching and contamination of groundwater around agrichemical facilities became widely available. In response the Minnesota retailers improved their pesticide handling practices. The 1996 sampling plan was designed to find a "before and after" comparison in which 30 agrichemical facilities were selected at random and sampled during the summer of 1996. Pesticides were detected in soil at 28 of the 30 facilities. Of the 93 samples taken, 68 percent had detection of pesticides registered after 1989, indicating that even after the improved practices the problem persists. The greatest number of pesticide detections occurred in the bulk pesticide mix and load areas. Results of the Minnesota Department of Agriculture study show that the current Minnesota bulk pesticide storage rules are an excellent baseline regulation helping to prevent contamination from large releases, but that they cannot be effective without proper management and adequate housekeeping.

6.2 Valuation of the Benefits of the Pesticide Containment Rule

6.2.1 Theoretical Approach

For this analysis, remediation efforts and associated costs are assumed as part of the baseline scenario. The benefit of a pesticide containment rule is therefore the difference between the social cost of accidental releases in the absence of the rule, assuming that spills are followed by remediation efforts, and the social cost in the presence of the rule. The social costs associated with a single spill are diagrammed in Figure 6.2.

Figure 6.2a shows the case in which the level of remediation undertaken in the baseline scenario is optimal, i.e., the case in which the percentage of the spill cleaned up (p*) is such that the marginal cost of cleanup equals the marginal benefit of cleanup, so that the net benefit of cleanup is maximized. The total benefit of remediation is shown as the area under the marginal benefit curve to the left of p*, or areas 1 plus 2. The cost of the cleanup is the area under the marginal cost curve to the left of p*, or area 2. The net benefit of cleanup is area 1, total benefit less cost of cleanup. At this optimal level of cleanup in the baseline scenario there is contamination remaining, with the potential for environmental damage. The value of avoiding this damage is depicted as the area under the marginal benefit curve to the right of p*, or area 3, which is less than the cost of cleaning it up (area 3 plus area 4). The benefit of preventing the spill in the first place (i.e., the benefit that would be achieved by the pesticide containment rule if it prevented the spill) is the sum of the avoided remediation costs (area 2) and the value of the avoided environmental damage that would remain after cleanup, or area 3. The benefit achieved by the pesticide containment rule by preventing this spill is therefore area 2 plus area 3.

Figure 6.2b shows two cases in which the level of remediation undertaken in the baseline scenario is suboptimal. Cleanup of p_1 percent is a case of insufficient cleanup; cleanup of p_2 percent is a case of too much cleanup. Whatever the level of cleanup in the baseline, however, the calculation of the benefit of preventing the spill in the first place follows the same logic as when the optimal level of cleanup was undertaken. The value of avoiding the spill is the value of avoided remediation cost (the area under the marginal cost curve to the left of the level of

cleanup) plus the value of avoiding the environmental damages that would have occurred prior to and/or remain after remediation was undertaken (the area under the marginal benefit curve to the right of the level of cleanup).

If, for example, the level of cleanup in the baseline scenario is p_1 (i.e., if there is insufficient cleanup), then the value of avoiding the spill in the first place is area 2 (the avoided remediation costs) plus the sum of areas 3, 4, and 5 (the value of avoiding the environmental damage that would have remained after cleanup). If the level of cleanup in the baseline scenario is p_2 (i.e., if there is too much cleanup), then the value of avoiding the spill in the first place is the sum of areas 2, 4, and 6 (the avoided remediation costs) plus area 5 (the value of avoiding the environmental damage that would have remained after cleanup).

Figure 6.2 illustrates several things. First, it shows that there are two components to the benefit of avoiding a spill: (1) the avoided remediation costs, and (2) the value of avoiding the environmental damages (i.e., the human health risks and ecological damages) that would occur prior to and/or remain even after remediation had occurred. Second, it illustrates that the magnitude of the benefit of avoiding the spill depends on what would have been done in the baseline scenario (i.e., in the absence of the pesticide containment rule)—in particular, it depends on the level of remediation that would have been undertaken. Finally, it shows that how well an estimate of avoided remediation cost approximates the total benefit of avoiding the spill in the first place depends on the percent cleanup that would be undertaken in the baseline scenario. If in the baseline scenario a spill was 100 percent cleaned up (which would not be the optimal level of cleanup), then the avoided remediation cost would be the total benefit of avoiding the spill. As the baseline level of cleanup decreases, however, avoided remediation cost constitutes less of the total benefit of avoiding the spill, and so becomes a poorer estimate of the total benefit of avoiding the spill.

Figure 6.2. The Costs and Benefits of Remediation (Cleanup) in the Baseline Scenario and the Calculation of the Benefits of Avoiding a Spill

Figure 2a: The Optimal Level of Cleanup

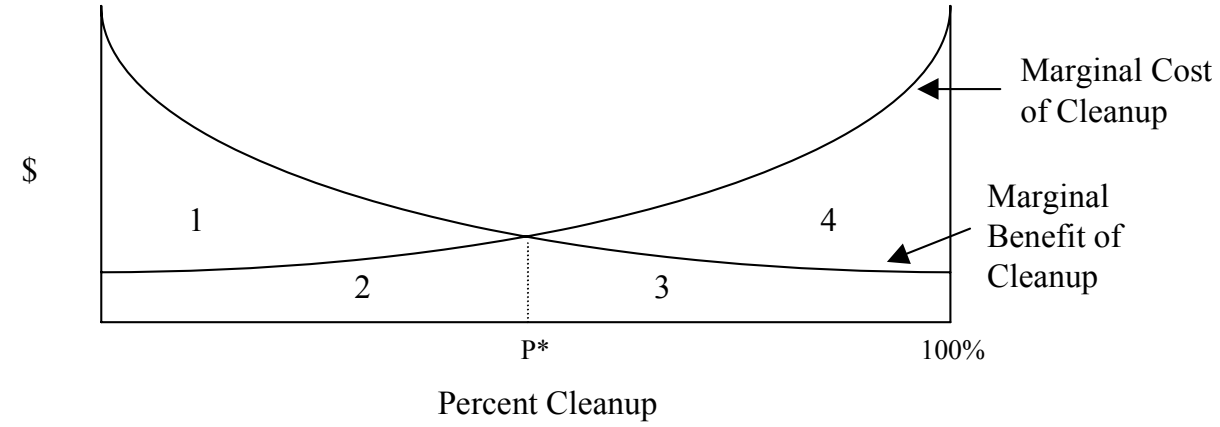
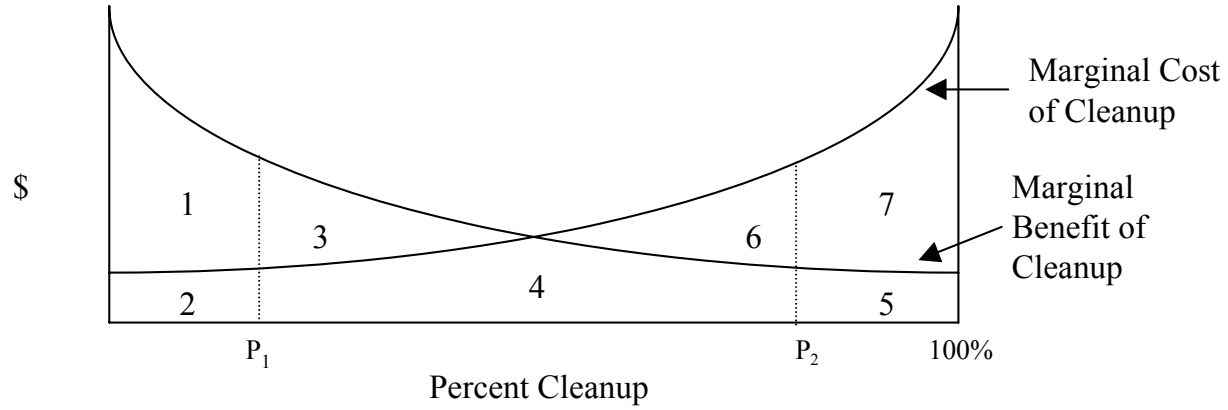


Figure 2b: The Suboptimal Level of Cleanup



6.2.2 An Outline of the Estimation of the Total Benefits of a Pesticide Containment Rule

As noted above, this analysis assumes that some remediation will occur in the baseline scenario. Given this assumption, the total benefits of a pesticide containment rule would be comprised of the avoided remediation costs plus the value of avoiding the environmental damage (the human health risks and ecological damage) that would occur prior to and/or remain after remediation was undertaken.

The general sequence of steps for a complete benefits analysis is as follows:

- Identify the specific pesticides accidentally released from bulk storage facilities;
- Estimate the change in probability of releases that would be expected to result from implementing the proposed standards;
- Estimate the avoided remediation costs expected to result from the reduced probability of release;
- Estimate the change in human health risks and ecological damages occurring prior to and/or remaining after remediation efforts that would result from the predicted changes in releases;[64]
- Value those risk and damage reductions; and
- Add the value of risk and damage reductions to the avoided remediation costs.

The estimation of avoided remediation costs will be discussed in discussed in Section 6.3. To derive an estimate of the total benefits of the pesticide containment rule, in addition to estimating the avoided remediation costs, it would be necessary to estimate (1) what health and ecological damages would be likely to occur prior to remediation and/or remain after remediation efforts and (2) the value of avoiding those damages. For adverse effects associated with off-site contamination in particular, the estimation of the changes in risks that would result from reductions in the frequency of accidental releases would require an analysis of the fate and transport of the pesticides released. Such an analysis is beyond the scope of what is feasible here. Valuing the risk and damage reductions is also particularly difficult, and, due in large part to limitations in the available data, will not be attempted in this analysis. However, the final two sections, 6.4 and 6.5, present a qualitative discussion of the human health and ecological benefits of the final containment regulations.

6.3 Estimation of the Partial Benefits from Avoided Costs of Remediation

This section provides an estimate of the partial benefits of the pesticide containment rule from avoided costs of remediation following a release from a bulk pesticide storage facility. An estimate of the total benefits, including the value of risk reduction from avoided human health and ecological damage, cannot be determined without additional research. This benefits analysis therefore uses the available information on remediation costs to provide partial (lower-bound) estimates of the benefits that are likely to result from the pesticide containment rule. The total (upper-bound) benefits are not estimated, but a qualitative discussion of the human health and ecological benefits that would accrue under the pesticide containment rule is provided in Sections 6.4 and 6.5.

[64] The health risks and ecological damage associated with a given pesticide will depend on the levels at which exposure occurs. Not only the incidence of a given (human health or ecological) endpoint but also the type of endpoint may change as the exposure level and duration change.

6.3.1 Avoided Costs of Remediation to Agricultural Pesticide Refillers and Agricultural Commercial Applicators

Estimation of the avoided remediation costs that would result from the pesticide containment rule requires information on the number of bulk storage facilities covered by the rule, the probability of a release at a bulk storage facility with and without the rule, and the cost of remediating such releases.

There are several unknown factors that preclude quantifying with accuracy the partial benefits that would accrue from avoided remediation costs. Perhaps the principal unknown is the percent probability that a release will occur. Other unknown factors include the value of the damage, which will tend to be highly variable according to the severity of the spill, and site-specific considerations. Also, the baseline level of cleanup required at these spill sites is generally not known. Even in those cases in which estimates of remediation costs are available, such estimates do not indicate the percent cleanup associated with those costs. In addition, there is insufficient information to estimate the value of avoiding the environmental damages occurring prior to or remaining after remediation. For this analysis, these numbers have been approximated based on available data and information, and other general underlying assumptions.

This benefits analysis therefore uses the available information on remediation costs to provide lower-bound estimates of the benefits that are likely to result from the pesticide containment rule. Depending on the baseline degree of remediation and the valuation of the benefits of cleanup, these may substantially understate the total benefits that would result from the rule.

The avoided remediation costs attributable to the regulation are calculated as:

$$C = N * \Delta p * m$$

where:

- C = the total cost of remediation;
- N = the number of bulk storage facilities covered by the regulation;
- p_o = the probability of a release at each of the N bulk storage facilities in the baseline case (without the regulation);
- p_1 = the probability of a release at each of the N bulk storage facilities in the control case (with the regulation);
- $\Delta p = p_o - p_1$ = the change in probability of a release induced by the regulation; and
- m = the average cost of remediation.

The values for most of these variables are not well documented. Therefore, only general ranges of estimates are presented here based on estimates shown below.

6.3.1.1 Estimation of the Number of Bulk Storage Facilities Covered by the Rule *(N)*

As shown in Chapter 3, approximately 5,250 agricultural pesticide refiller and commercial applicator facilities store agricultural pesticides in bulk storage containers. These facilities plus an additional 561 facilities that store agricultural pesticides, but are classified as non-bulk

storage, perform dispensing/refilling activities that could be subject to regulation. This results in a total of 5,811 (= 5,250 + 561) units (see Table 3.2).[65]

6.3.1.2 Estimation of the Baseline Accidental Release Probability *(p_o)*

As summarized in Table 6.1, the limited number of estimates of the annual frequency of spills from bulk storage facilities ranges from 0.9 percent to 1.5 percent. That is, the annual probability of an accidental release from a randomly selected bulk storage facility is anywhere from 0.009 to 0.015. A reasonably conservative estimate, then, based on the limited information available, would be 0.01 (a 1 percent probability). This means that, out of the approximately 5,811 facilities in the United States, about 58 (= 0.01 x 5,811) would be expected to experience an accidental release annually in the baseline scenario.

The 58 accidental releases in the baseline scenario would be expected to occur either at those facilities with existing containment structures that need to be retrofitted to comply with the new rule, or at those bulk storage facilities without existing containment structures. Because the estimate of a 1 percent release probability is based on information from past years (the reporting periods were from the mid-1980s to 1990 or 1991, as shown in Table 6.1), the estimate of 1 percent may be biased either up or down. In particular, if the percentage of bulk storage facilities without existing containment structures or with existing containment structures in need of retrofitting is substantially smaller at present than during the reporting periods listed in Table 6.1 (for example, if many facilities are now in compliance with state regulations implemented since those reporting periods), then the estimate of 1 percent could be biased upward. For reasons noted above, however, the estimate of 1 percent could be biased downward (because, for example, it most likely excludes many non-reported spills and chronic leaks). Because there are two possible biases in opposite directions, and in the absence of further information on the extent of the possible biases, this analysis uses the estimate of a 1 percent release probability, noting that this estimate could change in the future if further information becomes available.

6.3.1.3 Estimation of the Average Cost of Remediation per Release *(m)*

Remediation costs are highly variable and are dependent on the magnitude of the release and other site-specific conditions. Based on available data and information, however, a representative range would be $10,000 to $1 million per spill. This range was determined based on the following information and is presented in Table 6.3.

From approximately 100 dealership remediation cases, the Minnesota Department of Agriculture has estimated that 50 to 60 percent of the contaminated sites will be remediated for at least $20,000 to $50,000, not counting certain costs such as attorney fees; 20 percent will be remediated for $50,000 to $200,000; and 20 percent for more than $200,000, with costs occasionally crossing the million-dollar mark (EPA, 2005a).

[65] The 5,040 agricultural pesticide refiller facilities, 561 non-bulk facilities, and 210 agricultural commercial applicator facilities include facilities with bulk pesticide storage both with existing containment structures and those without existing containment structures. Facilities without existing containment structures will have to install structures to comply with the new rule. Some facilities with existing containment structures will already be in compliance with the new rule; others will have to retrofit to be in compliance.

The Illinois Environmental Protection Agency noted that, while firm substantiating data do not yet exist, it seems likely that two-thirds of the state's 1,500 commercial agrichemical sites could eventually be found to warrant some degree of remediation for contamination "hot spots." Typical costs for assessment and remediation for most facilities are estimated to average between $15,000 and $50,000. Fifteen percent of the facilities are projected to require more extensive cleanup (cost range $50,000 to $250,000), and 2 percent to 5 percent could encounter even greater remediation costs (Taylor, 1991).

Table 6.3. Estimation of Average Costs for Assessment and Remediation of Uncontrolled Spills at Agricultural Chemical Dealers and Applicators

Cost Category [a]		Frequency Distribution [b]		Weighted Average Cost [c]	
Range	**Point Estimate**	**Low Cost**	**High Cost**	**Low Cost**	**High Cost**
$1 to $19,999	$13,800	25%	10%	$3,450	$1,380
$20,000 to $99,999	$82,800	35%	25%	$28,980	$20,700
$100,000 to $249,999	$241,500	20%	35%	$48,300	$84,525
$250,000 to $499,999	$517,500	15%	20%	$77,625	$103,500
$500,000 to $999,999	$1,035,000	5%	9%	$51,750	$93,150
$1,000,000 or more	$1,725,000	0%	1%	$0	$17,250
TOTAL—Calculated (Rounded)		**100%**	**100%**	**$210,105 ($210,000)**	**$320,505 ($320,000)**

[a] Costs represent the remediation of individual uncontrolled spill events. Therefore, the costs do not represent the costs for cleanup of sites with a long-term contamination history.
[b] DPRA Incorporated estimates based on a review of literature and field contacts. Key sources include EPA (2005) in Minnesota and Taylor (1991) in Illinois for the low-cost estimate. The high-cost scenario reflects consideration that certain transaction costs (lawyer fees and management costs) may not be included and future remediation requirements and costs will be more stringent.
[c] Weighted average costs are calculated by multiplying the point estimate with the corresponding frequency distribution. For example, for the $1-$19,999 range, the weighted average cost (low) is [13,800*0.25] = 3,450. Cost ranges and point estimates are based on data from the early 1990s and are reported in 2005 dollars.

In 1993, the State of Illinois completed a study on the cost of remediating agrichemical sites in the state. State officials estimated that the cost of site characterization and remediation for all sites in the state (1,200 sites) would be about $48 million to $124 million or $40,000 to $100,000 per site. This is interpreted as a mean for all sites; several sites are not likely to incur any remediation costs. Also, the cost estimates do not include any costs for groundwater remediation because of data limitations and do not include engineering costs associated with site characterization, which can range between $5,000 and $20,000 per facility (Illinois Department of Agriculture, 1993).

Similarly, a study conducted by the WDATCP indicates that 45 to 75 percent of the commercial pesticide mixing and loading facilities are likely to require soil remediation, and many may also need groundwater remediation (Morrison and Kefer, 1991). Typical costs for soil remediation range from $10,000 to $50,000. However, if groundwater contamination is encountered, especially if municipal water supplies are affected, the costs can be much higher. For example, in a case with which the WDATCP was involved, an agricultural pesticide refiller facility paid about $100,000 to characterize a groundwater contamination plume that affects a municipal

drinking water supply. The facility projects that it will pay an additional $250,000 to install groundwater remediation equipment. Operational costs will add another $20,000 for each year the equipment is used. In addition, the facility may need to demolish, excavate below, and replace a new $30,000 containment system that was built over contaminated soil (Morrison, 1991).

In Iowa, where roughly half of the pesticide dealerships are estimated to require remediation, direct costs for site assessments and monitoring and remediation of dealerships could reach $50 million to $100 million (Frieberg, 1991). The Iowa Natural Heritage Foundation completed 22 case studies of site remediation for agricultural chemical dealers covering remediation for chronic releases as well as sudden spills. At the time of the study, costs of $1.8 million had been incurred at the 22 sites, but only five had conducted or were conducting remediation. Most sites had been conducting only assessment and monitoring. Costs varied greatly, but the site farthest along in remediation had spent $325,000. Another site had already spent $400,000 in 3 years to achieve an earlier stage of the remediation process. The study concluded, however, that cleaning up contamination from single spills, for which pesticide containment would be most useful, was less expensive (Gannon, undated).

The State of Illinois has established a fund to help dealers pay for environmental cleanup costs after a pesticide release incident. This program, administered by the Illinois Department of Agriculture, will reimburse dealers for up to $0.5 million annually for cleanup costs (Simmonds and Brosten, 1991). At two or three incidents per year, this is equivalent to costs of $170,000 to $250,000 per incident. However, there are documented instances where remediation costs for a major soil and groundwater contamination incident are expected to be much greater. An example of this is a March 28, 1990, incident at Myers, Inc., an agricultural pesticide refiller in Lexington, Illinois, that had a fire (Simmonds and Brosten, 1991). Cleanup at this site will cost $1.0 to $1.5 million. Similarly, insurance companies recommend that agricultural chemical dealers have a minimum of $1 million in pollution insurance coverage (Pelzer, 1992).

6.3.1.4 Estimation of the Total Cost of Remediation *(C)*

The above information does not, in itself, provide an estimate of the average cost of remediation. For this analysis, we developed a high estimate and a low estimate of the average cost of remediation, based on the documented general range of costs and two reasonable distributions (a "high-cost" distribution and a "low-cost" distribution) of remediation costs. A simple average of the two distributions was taken to arrive at average high and low estimates. These two cost distributions and the resulting low and high estimates of the average cost of remediation are shown in Table 6.3.[66]

Based on these distributions, the average avoided remediation costs would range from about $210,000 to $320,000 per incident avoided. These costs are assumed to be applicable for both bulk storage releases and dispensing/refilling/mixing/loading area releases as no information is available to justify a difference, although the dispensing/refilling type incidents might be smaller.

[66] The low and high cost estimated in Table 6.3 is based on the point estimate for each range of remediation cost and the probability of that remediation cost occurring.

The costs are also assumed to occur over a relatively short time period because responses to sudden spills start rapidly[67] and are assumed to be completed in less than 1 year.

The estimation of avoided remediation costs assumes that all accidental releases would be prevented by the pesticide containment rule. That is, given that the initial probability of release was 0.01 and it will be reduced to zero, the change in the probability of a release (Δp) is assumed to be 0.01. Given 5,811 facilities covered by the rule, and using the lower-bound estimate of $210,000 as the average remediation cost per release, the lower-bound estimate of avoided remediation costs to agricultural pesticide refillers and agricultural commercial applicators with bulk pesticide storage would be:

$$C = N * \Delta p * m = 5{,}811 * 0.01 * \$210{,}000 = \$12.2 \text{ million}$$

Using the upper-bound estimate of $320,000 as the average remediation cost per release, the upper-bound estimate of avoided remediation costs to agricultural pesticide refillers and agricultural commercial applicators would be:

$$C = N * \Delta p * m = 5{,}811 * 0.01 * \$320{,}000 = \$18.6 \text{ million}$$

As mentioned earlier, these estimates represent the partial (lower-bound) estimates of the benefits that are likely to result from the pesticide containment rule. The total (upper-bound) benefits that would include the benefits of risk reduction to human health and ecological systems are not valued due to a lack of available data.

6.3.2 Uncertainties in the Estimate of Avoided Remediation Costs

Some uncertainty surrounds all three component inputs used to calculate the remediation costs that would be avoided by implementing the pesticide containment rule *(N,* Δp*,* and *m.).* The number of facilities covered by the rule *(N)* is not readily available, and is based primarily on 1992 data from multiple sources in the proposed EPA containment rule RIA. EPA's efforts to validate this estimate failed to provide a more accurate estimate of the actual number of facilities covered by the rule, which may now be either higher or lower.

As discussed above, there is substantial uncertainty surrounding the estimates of the change in the probability of an accidental release that would be induced by the rule (Δp). There are just three studies available that provide an estimate of the baseline probability of release *(p_o)*, and these studies may or may not be indicative of the probability of release for all facilities covered by the rule. These studies were published in the early 1990's, and several States have since promulgated containment regulations. The probability of release in States with regulations may be lower than 1%. On the other hand, two of the studies reporting incidents were in States that have regulations. There is also the potential for a higher baseline probability of release in States without containment regulations. The estimate of a 1% probability of release may be an underestimate or overestimate of the actual probability of release.

[67] We contacted state officials in Ohio, Nebraska, Wisconsin, Florida, and Kansas by telephone regarding the timing of cleanup for pesticide spills. Their responses indicated that cleanups of major spills at tank facilities are initiated quickly; responses ranged from immediately (MacKedanz, 1993; Lee, 1993; Kline, 1993); within hours (Buttermore, 1993; Belt, 1993); to within days (Beal, 1993).

The analysis also assumes full compliance with the regulations and that there will be no accidental releases with full compliance. However, there may be facilities that do not fully comply with the regulations, resulting in a probability of release with the regulation greater than zero. As mentioned above, two studies report incidents in States with regulations. Possible explanations are that the regulations in these States were not as comprehensive as the EPA regulations, resulting in accidental releases, or that facilities were not in full compliance with the States' regulations.

There is also uncertainty in the estimate of the average remediation cost per accidental release *(m).* Similar to the other inputs, the information on the cost per accidental release is not readily available, and the available data are not recent. The estimates are based on eight studies from the early 1990s. Although the analysis accounts for the range of costs presented in these studies, these studies may not represent the full range of remediation costs.

Any change in the assumptions made regarding *N,* Δp*,* and *m* will result in a different estimate of the remediation costs avoided as a result of the regulations. Since the direction of the uncertainty is unknown, the impact of the uncertainty on the estimate of avoided costs (i.e., whether the uncertainty results in higher or lower costs) is unknown, as well.

The following example demonstrates the impacts of varying these assumptions on the estimated remediation costs avoided. Suppose that the baseline probability of a release (p_o) is actually 0.004 (rather than 0.01). Suppose further that instead of reducing the probability of an accidental release to 0 (as was assumed in the analysis), the pesticide containment rule reduces the control scenario release probability to 20 percent of the baseline scenario release probability—or 0.2 x 0.004 = 0.0008. The change in release probability (Δp) would then be 0.004 - 0.0008 = 0.0032.

Given the original estimates of *N* and *m,* the lower-bound estimate of avoided remediation cost to agricultural pesticide refillers and agricultural commercial applicators would be:

$$C = N * \Delta p * m = 5{,}811 * \ 0.0032 * \ \$210{,}000 = \$3.9 \text{ million.}$$

The upper-bound estimate of avoided remediation costs would be:

$$C = N * \Delta p * m = 5{,}811 * \ 0.0032 * \ \$320{,}000 = \$6.0 \text{ million.}$$

6.3.3 Uncertainties in the Estimate of the Benefits of the Pesticide Containment Rule

Various sources of uncertainty in the estimation of the benefits that would result from implementation of the pesticide containment rule have been discussed in previous sections. Recalling the discussion of total benefits in Section 6.2, there are two broad categories of benefits that would be expected to result from implementation of the pesticide containment rule: (1) avoided remediation costs and (2) the benefits of avoiding the human health risks and ecological damages that would occur prior to and/or remain after remediation efforts were undertaken. The second component of benefits was not estimated for this analysis, but we provide a qualitative discussion of the benefits that may accrue from reduced risks to human health (Section 6.4) and ecological systems (Section 6.5).

The relevant uncertainty is how well the estimate of avoided remediation costs approximates the *total* benefits of implementing the pesticide containment rule. Restated, there are two broad sources of uncertainty: (1) uncertainty about how well avoided remediation costs are estimated, and (2) uncertainty about how well avoided remediation costs estimate total benefits. The uncertainties surrounding the estimate of avoided remediation costs are discussed in Section 6.3.2. How well avoided remediation costs approximate total benefits depends on the shapes of the marginal cost and marginal benefit (of remediation) curves (diagrammed in Figure 6.2) and on the percent cleanup that would be undertaken in the baseline scenario. As the percent remediation that would be undertaken in the baseline scenario increases, avoided remediation costs provide a better approximation of the total benefits of the pesticide containment rule.

6.4 The Potential Human Health Risks Associated with Exposure to Pesticides

The benefits of the pesticide containment regulations include reductions in health risks both to the general population in the geographic areas in which the bulk storage facilities are located and to pesticide handlers from improved containment of bulk pesticides in facilities operated by agricultural refillers and commercial applicators. As discussed in Section 6.1, there is ample evidence that spills and leaks are occurring at agricultural refiller and commercial applicator facilities with bulk pesticide containment. Unfortunately, data are not available to quantify the effects of these spills and leaks on humans (or the environment).

The limited data that are available provide some information on the frequency of exposure (i.e., frequency of leaks and spills) and on the types of pesticides that are being spilled (see Section 6.1). For example, based on the available data, we estimate that as many as 58 accidental releases occur each year from bulk storage facilities (see Section 6.3), and that pesticides, such as atrazine, alachlor, chlorpyrifos and diazinon, are frequently detected on or near agricultural facilities in Illinois (see Table 6.2). However, information on the level of human exposure from these spills is not readily available, nor is information on the human health effects of this exposure. In the absence of these data, we cannot estimate any human health benefits associated with the final containment regulations.

The following two sections describe, first (in Section 6.4.1), the exposed populations and the data limitations on identifying the frequency and level of exposure for these populations relative to bulk pesticide containment, and second (in Section 6.4.2), the pesticides that the at-risk populations are more often exposed to and risks associated with these pesticides.

6.4.1 Exposed Populations

6.4.1.1 The General Population

Releases from bulk storage areas may allow pesticides to enter the air, soil, or water. The nature of the contaminated media will depend on the type of release (e.g., sudden or chronic) as well as on the physical and chemical characteristics of the pesticides and their inert ingredients. Improvements in bulk storage facilities are anticipated to reduce exposure of the general population that has resulted in the past from pesticides being released from bulk storage facilities by accidental spills, fires, or leakage. To result in exposure of the general population, these

releases have had to migrate into aquifers, volatilize into the air, and/or contaminate soil used to grow food.

Food contamination may occur: (1) through direct exposure (e.g., direct spillage onto food products); (2) through food plant uptake from contaminated soil or water; and (3) through bioaccumulation in plant or animal life that is itself a food source or is food for animals that are ultimately consumed by people.

Airborne releases may occur due to simple volatilization or as a result of fires. The latter type of release is often more serious (Buzicky, et al., 1992). The water used in fire management may spread the pesticide widely, contaminating soil and water. With this release scenario, the public is, again, primarily exposed via water.

There are a number of sources of data on spills. However, it is important to note that these data only describe spill incidents that were clearly noticeable. Chronic small spills largely go unnoticed. Further, the data do not specify the cause of the spill (e.g., a breach in pesticide containment, which is necessary to associate the spill with the final pesticide containment standards), the population exposed, or the level of exposure. The data sources include a federal reporting mechanism in place at the National Response Center (NRC), for some specified substances above a threshold quantity. In addition, the Nebraska Department of Environmental Control maintains a spill incident database that includes reports of pesticide spills. The Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP) also has information on pesticide spills. Finally, the Michigan Department of Agriculture has a compiled summary of agriculture-related pollution emergency incidents that includes bulk storage facilities.

6.4.1.2 Pesticide Handlers

Pesticide handlers will interact with safer containment equipment as a result of the rule, which should reduce the number of spills and human contact. This reduction is expected to consequently reduce inhalation and dermal exposure. Data do not specifically address exposure at containment facilities. However, the California Department of Pesticide Regulation (CDPR) conducts ongoing surveillance of people and the environment to detect the potential for pesticide exposure as part of its pesticide safety program. CDPR's Pesticide Illness Surveillance Program (PISP) has required mandatory reporting of pesticide illnesses since 1971, making it the most comprehensive monitoring program in the country. Under a California state statute, physicians are required to report any suspected case of pesticide-related illness or injury to the local health officer within 24 hours of examining the patient.

In addition, CDPR reviews doctor's reports for workers' compensation claims under PISP. Staff members investigate any claim that mentions (1) pesticides as a possible cause of illness or injury or (2) unspecified chemicals if the setting is one in which pesticide use is likely. CDPR also works with the California Poison Control System to facilitate reporting of pesticide-related illnesses by health care workers. In 1999, CDPR reported 1,201 episodes in which the pesticide exposure was at least a possible contributing factor to illness or injury (CDPR, 2001a,b).

However, the CDPR data largely have information on small container spills, and no episodes were found in the database related to bulk pesticide containment-related spills.[68]

6.4.2 Pesticides Evaluated

Pesticide-contaminated soil and groundwater on, or near, commercial agricultural chemical facilities have been measured in numerous states. Dozens of chemicals have been found. For purposes of this benefits assessment, we examined a short list of pesticides found in a major agricultural state, Illinois, for potential human health effects.

A list of the pesticides identified in wells on or near agricultural facilities in Illinois, and the contaminant level measured, was presented in Table 6.2.[69] Although the potential cause of contamination is not listed for many facilities, loss from bulk storage facilities through leakage or spills probably contributes to the contaminant levels. Table 6.2 contains results from one of many well studies. No national studies are available that enumerate pesticides specifically associated with spills and leakage from containment facilities.

The Illinois data are used as a reasonable sampling of pesticide contamination that is likely to occur. The pesticides identified in wells in Table 6.2 are in high use in many agricultural areas of the United States.[70] The observed human health effects associated with the pesticides listed in Table 6.4 provide an indication of the types of risks that are likely to be reduced as a result of improvements in bulk storage facilities.[71]

[68] For the container rule, EPA examined case summaries from the Pesticide Illness Surveillance Program (PISP) database maintained by the California Department of Pesticide Regulation (CDPR) for 1999 (CDPR 2001a,b) and estimated the number of cases that are "very likely," "possibly," and "unlikely" to be avoided as a result of the regulations. The estimates of cases that were "very likely" to be avoided as a result of the regulations were used to calculate the ratio of pesticide container design/residue-related cases to total pesticide product incidents in California. EPA applied this state-level proportion to the United States as a whole to estimate the annual national number of avoided pesticide product illnesses that are expected as a result of the container design and residue removal regulations.

[69] Fifty-six wells near commercial pesticide facilities were tested in Illinois by the Department of Health. Forty-three (77 percent) were contaminated by pesticides (Fawcett, 1989).

[70] The WDATCP/WDNR study (discussed in Section 6.2) found several of the same pesticides (e.g., alachlor, atrazine, and metolachlor) as soil contaminants at 20 facilities in Wisconsin (Habecker, 1989) as were found in the Illinois study.

[71] The health effects information provided in Table 6.4 is a summary of health effects reported from numerous sources. The text source (Cunningham and Hallenbeck, 1984) lists health effects reported primarily from the egistration data submitted to EPA by pesticide manufacturers. In addition, toxicology texts and journal articles were used to develop the lists of effects reported in this book (full citations in text).

Table 6.4. Potential Health Effects of Selected Pesticides

Pesticide	Class	Health Effects
alachlor	acetanilide	abdominal distress, anemia, ataxia, brown blood, cancer, chills, collapse, convulsions, cyanosis, dermal effects (irritation, dermatitis, sensitization), diarrhea, dizziness, dyspnea, eye irritation, gastrointestinal irritation, jaundice, liver damage, mucous membrane irritation, muscular weakness, nausea, nephritis, ocular damage, postnatal damage, prenatal damage, shock, sweating, vomiting, death due to central nervous system depression, circulatory or respiratory failure.
atrazine	triazine	abdominal pain, adrenal function impairment, adrenal degeneration, anemia, anorexia, brain edema and dystrophy, cardiac dilation, central nervous system abnormalities, convulsions, dermatitis, diarrhea, erythema, eye irritation, conjunctivitis, exopthalmia, corneal opacity, iritis, growth retardation, hematocrit depression, hemoglobin depression, hypothermia, liver hemorrhage, mutagenesis, nausea, ovarian hemorrhage, paralysis, prenatal damage, respiratory edema and hemorrhage, pneumonia, bronchitis, bradypnea, dyspnea, hyperpnea, salivation, spasms, spleen hemorrhage, thiamine and riboflavin function disturbed, tremors, vomiting. (Bioaccumulates in fat of animals and humans.)
chlorpyrifos	organophosphate (One of the most common pesticides in reports of human poisonings)	acidosis, presence of alkyl phosphates in urine, anorexia, anoxia, aphasia, areflexia, ataxia, cardiac abnormalities (bradycardia/tachycardia, heart block), cholinesterase inhibition, central nervous system impairment, coma, confusion, convulsions, cyanosis, dermatitis, diarrhea, dizziness/vertigo, electroencephalograph abnormalities, eye abnormalities (miosis/mydriasis, pain, pressure, tearing, dark or blurred vision, cataracts), gastrointestinal distress (hyperperistalsis, heart burn, cramps), hallucinations, headache, hyperglycemia, hypertension, hyperthermia, incontinence, leukopenia, liver damage, muscle atrophy and twitching, nausea, pallor, paresis, parethesias, psychosis, renal damage, respiratory distress (apnea, rales, ronchi, wheezing, pulmonary edema), salivation, shock, somnolence, sweating, vomiting, weakness, death due to respiratory failure.
cyanazine	triazine	abdominal pain, adrenal degeneration, adrenal function impairment, anemia, dermal sensitization, dermatitis, diarrhea, eye irritation, hepatic degeneration, myocardial degeneration, mucous membrane irritation, nausea, renal degeneration, thiamine and riboflavin function disturbed, vomiting. (Bioaccumulates in fat of animals and humans.)
diazinon	organophosphate	acidosis, presence of alkyl phosphates in urine, anorexia, anoxia, aphasia, areflexia, ataxia, cardiac abnormalities (bradycardia/tachycardia, heart block), cholinesterase inhibition, central nervous system impairment, coma, confusion, convulsions, cyanosis, dermatitis, diarrhea, dizziness/vertigo, electroencephalograph abnormalities, eye abnormalities (miosis/mydriasis, pain, pressure, tearing, dark or blurred vision, cataracts), gastrointestinal distress (hyperperistalsis, heartburn, cramps), hallucinations, headache, hyperglycemia, hypertension, hyperthermia, incontinence, leukopenia, liver damage, muscle atrophy and twitching, nausea, pallor, paresis, parethesias, psychosis, renal damage, respiratory distress (apnea, rales, ronchi, wheezing, pulmonary edema), salivation, shock, somnolence, sweating, vomiting, weakness, death due to respiratory failure.
metolachlor	acetanilides	abdominal distress, anemia, ataxia, brown blood, cancer, chills, collapse, convulsions, cyanosis, dermal (irritation, dermatitis, sensitization), diarrhea, dizziness, dyspnea, eye irritation, gastrointestinal irritation, jaundice, liver damage, mucous membrane irritation, muscular weakness, nausea, nephritis, prenatal damage, shock, sweating, vomiting, death due to central nervous system depression, circulatory, or respiratory failure.
metribuzin	triazine	abdominal pain, adrenal function impaired, anemia, dermatitis, diarrhea, eye irritation, mucous membrane irritation, nausea, thiamine and riboflavin function disturbed, vomiting. (Bioaccumulates in fat of animals and humans.)

Source: Cunningham and Hallenbeck, 1984.

6.5 The Potential Ecological Damages Associated with Exposure to Pesticides

The final pesticide containment regulations will reduce the adverse effects on ecosystems of sudden and chronic releases of pesticides from containment facilities. This includes reductions in adverse impacts on flora and fauna including fish, mammals, reptiles, insects, and plants. Due to the complex interrelationships among plants and animals and the ability of toxic chemicals to move through the food chain, pesticide contamination of biomaterials is often difficult to track, contain, or remedy. In some cases contamination can move up the food chain and become a human health risk.

To estimate the benefits associated with avoided environmental incidents, data are needed from which one can relate containment-related spills to property damage and the related costs of cleanup. However, the extent to which pesticide-related environmental incidents occur in the United States is not very well documented. The primary clearinghouse for the reporting of such incidents is the Ecological Incident Information System (EIIS), a database maintained by the Ecological Fate and Effects Division of the Office of Pesticide Programs. The two primary source of incident reports that are submitted to the EIIS are reports filed by pesticide registrants and government agencies. Although FIFRA requires that pesticide registrants or manufacturers report to EPA any information related to known adverse environmental effects due to releases of their registered pesticides, many of these ecological incidents are probably not observed or reported.

For example, the California Department of Pesticide Regulations (CDPR) is thought to be at the forefront of state agencies in terms of pesticide recordkeeping, management, monitoring, and reporting. However, very few ecological incidents that occur in California are logged into the CDPR's database of priority investigations—their only statewide database that tracks such events (EPA, 2005a). In California, pesticide-related releases are initially investigated by county agricultural commissioners. If a particular release is deemed to meet "priority investigation status," it is referred to the CDPR and logged into their database of priority investigations. An annual summary of all priority investigations, if any, are then provided to the EPA for input into the EIIS. For non-health incidents, the current thresholds for categorizing an environmental incident as a priority investigation in California include:

> Animals and Wildlife: Any pesticide incident with associated level of mortality that exceeds the following:
>
> Non-Target Birds: 50
> Non-Target Fish: 500
> Listed Endangered or Threatened Species: 1
> Domesticated, Game, or Other Non-Target Animals: 5

As one can see from the priority investigation criteria, it is likely that many pesticide-related incidents occur but never warrant priority investigation status. California maintains no records of such incidents, and of the records it does maintain and submit to EPA, only three spill-related environmental incidents were reported between 1968 and the present.

The spill/leak-related incidents are singled out in the EIIS since they are the incidents most likely to be avoided by the promulgation of the pesticide containment regulations. Within the EIIS,

there have been 43 spill/leak-related aquatic and terrestrial environmental incidents reported since its inception in 1992 (with reports dating back to 1968). In total, 15 states have submitted spill-related environmental incident reports with varying degrees of severity. Incidents have ranged from an unknown number of species incapacitated to thousands of acute cases of animal mortality. Species affected include minnow, trout, catfish, largemouth bass, salmon, blue crab, banded water snake, American alligators, egrets, wood storks, and turkey vultures to name only a few. Of the spill-related incidents, however, the cause of only a handful can be categorized as potentially pesticide containment-related.

In fact, of the 43 spill-related incidents in the EIIS database that had sufficient description in the incident report, only two could be considered containment-related. They are summarized as follows:

- Chlorpyrifos termicide leaked while a technician was repairing a tank. A significant quantity spilled onto the driveway. The technician washed the spilled chemical into a storm drain, which ran into a public duck pond resulting in a possible fish kill. The total number of species affected was not reported (EIIS #I001849-001).
- A fish kill occurred on a creek in Sangamon County, Illinois, due to a leaking sight valve on a 1,000 gallon tank. The type of pesticide was not reported (EIIS #I0000659-001).

The extent of national pesticide containment-related environmental incidents reported in the EIIS is likely an underestimate of the actual number of containment-related incidents. Therefore, caution should be taken in using EIIS to characterize the number and size of national pesticide containment-related incidents that could be avoided once the final regulations are in place. Though this type of benefit is not quantified in the current analysis, it should be noted that such benefits are likely to exist in association with the pesticide containment standards.

Apart from EIIS, another database that tracks hazardous material releases is the Accidental Release Information Program (ARIP) database, maintained by the Chemical Emergency Preparedness and Prevention Office (CEPPO) within the Office of Solid Waste and Emergency Response (OSWER). This database contains 4,946 records of incidents that occurred between 1986 and 1999. EPA administers the ARIP to learn about the causes and consequences of accidental releases of hazardous substances from fixed facilities and the actions that have been or could have been effective in preventing them from occurring. EPA uses select releases collected in the Emergency Response Notification System database for the ARIP questionnaire, targeting those accidental releases at fixed facilities that resulted in off-site consequence or environmental damage. Unfortunately, a search of the database and the questionnaire suggests that there is not sufficient information to identify containment-related spills.

Similar to the human health-related benefits section above (Section 6.4), the following two sections describe, first (in Section 6.5.1) the exposed populations, and, second (in Section 6.5.2), the pesticides that the at-risk populations are more often exposed to and risks associated with these pesticides.

6.5.1 Exposed Populations

Ecosystems are complex systems comprised of many interactions and interdependencies among species. Consequently, a minor deleterious effect at a low trophic level of the food chain can have major ramifications at higher levels. Alterations may or may not directly affect a species. They may affect its habitat or metabolic mechanisms, thereby altering survival, density, diversity, and reproduction (Morrison and Meslow, 1984a and 1984b; Rattner et al., 1982a and 1982b). The initially exposed population may not be the population that is ultimately of greatest concern. Pesticides may bioaccumulate up the food chain, reaching much higher concentrations (and greater toxicity) in the higher levels of an ecosystem (Cooper, 1991).

Assessment of exposed populations requires determination of the various species inhabiting the different portions of an ecosystem. These typically include avian, terrestrial, and waterborne animals, as well as plants. Because species are interdependent, a direct impact on one species may have a cascade effect on numerous others. It is therefore reasonable to assume that a reduction in exposure of any species may have benefits for multiple species in the same geographic area (occupying the same ecosystem).

Unlike human exposures, where the waterborne pathway is anticipated to be the primary mechanism of exposure, both water and soil contamination may be a substantial concern with respect to damage of biomaterials. Microorganisms and small insects that are critical to maintaining the food web of lower animals are affected by soil contamination. In addition, lower animals often interact directly with soil, and soil contamination may be delivered to target tissues through oral, dermal, or inhalation exposures. Soil contamination may directly and quickly kill insects; microorganisms; and, under high-dose conditions, small animals.

Waterborne contaminants may pose greater problems due to the rapid movement of water out of the immediate area of contamination. Under normal circumstances, water is anticipated to carry pesticide releases much greater distances, thereby causing more widespread contamination. In addition, aquatic organisms are intermittently or continuously submerged, resulting in relatively greater exposure as compared with other exposure pathways. Water contamination has been identified in fish and bird kills over many decades. Bioaccumulation of contaminants in fish who survive their exposure has led to toxic burdens in mammals that use them as food sources.

6.5.2 Pesticides Evaluated

The pesticides listed in Table 6.2 may also cause damage to most animals, and there exist similar research and data as presented in Table 6.4 on species-specific effects. There is no national listing of pesticides released from agricultural chemical facilities and their ecological effects. However, as discussed earlier (Section 6.4), the pesticides observed in Illinois are a reasonably representative *subset* of pesticides that may be released from bulk storage facilities.

Most pesticides are not species-specific in their effects. They cause the same types of effects across species (e.g., cholinesterase inhibition) and are capable of poisoning both target and non-target species (Cooper, 1991). While not identical in all respects, the functioning of the major organ systems is strikingly similar across most mammalian species. It is also similar in most respects to that of birds, fish, and reptiles. Various toxicological source data are available that provide acute and chronic toxicity measures for selected species.

Because of differences in the size, absorption, distribution, metabolism, presence or absence of target tissues, elimination, and detoxification mechanisms of different species, there are differences in the doses that will cause toxic effects and the occurrence of effects in different species (Cooper, 1991). For example, most small animals have a more rapid metabolism than larger animals and consequently consume more food in relation to their body weight. As a result of this, their exposure to contaminants will be greater on the basis of weight (in mg/kg). Some species have detoxification mechanisms for specific types of chemicals that cause them to be less susceptible than others. This makes prediction of adverse effects on specific species from a single study difficult and uncertain. EPA requires testing of pesticides on biomaterials, and the test data can provide additional insight into potential impacts. However, there are limited data of this type.

Fish and birds have unique susceptibilities due to their specialized breathing and movement adaptations. These have led to anatomical and physiological adaptations that increase their susceptibilities to some contaminants. A well-recognized example of this is the softening of eggshells among birds exposed to DDT (Cooper, 1991), which led to the near-extinction of some avian species. Fish, being immersed in water, have a much greater intake of and exposure to waterborne pesticides than most other species. Considerable pesticide-specific information is available regarding the toxic effects of pesticides to wildlife (Cooper, 1991). This information is readily available through the EPA Office of Pesticide Programs Web site (http://www.epa.gov/pesticides).

The benefits of avoiding damage to ecosystems include maintenance of species diversity and critical population levels. Destruction of members of a species may reduce the population to levels that cannot be sustained in an area. Impairment of reproduction (a common effect of pesticides—see Table 6.4) may lead to the same consequences. As noted above, the species in an ecosystem are interdependent, so that elimination of one species may have an impact on numerous others.

6.6 Summary of the Benefits of the Final Bulk Pesticide Storage Containment Regulations and Comparison with Proposed Regulations

6.6.1 Summary of the Benefit of the Final Containment Regulations

Uncontrolled releases of pesticides into the environment are well documented. The establishment of regulations for bulk pesticide containment structures at agricultural refiller and commercial applicator facilities will reduce such uncontrolled releases. This analysis attempted to measure the benefits of such regulations in reducing environmental contamination. In summary, the analysis estimates a cost savings from the final containment regulations of $12.2 million to $18.6 million from avoiding the cleanup of accidental releases from bulk pesticide containment facilities (Section 6.3). Due to a lack of available data on the human and environmental effects of exposure from accidental pesticide releases, the benefits of a reduction in the number of accidental releases to humans and the environment (i.e., a reduction in the exposure to pesticides) is not valued in this analysis. If quantified, these benefits would likely result in significantly higher benefits associated with the final containment regulations.

6.6.2 Comparison of the Benefits of the Final and Proposed Containment Regulations

The analysis of the benefits of the proposed containment regulations is similar to the analysis presented here for the final containment regulations. The primary differences in the analyses are the assumptions made in the analysis of the avoided costs of remediation. As in this analysis, the main component of the value of the benefits of the proposed containment regulations is the estimation of the cost savings from a reduction in the number of accidental releases of pesticides from bulk storage facilities; and, due to the lack of available data on the human and environmental effects of pesticide exposure from bulk pesticide storage facilities, the analysis of the benefits of the proposed regulations did not estimate the benefits of the regulations to humans and the environment.

The primary differences between the two analyses are the assumptions used in the calculation of the avoided costs of remediation between the two analyses. The benefits analysis of the proposed containment regulations assumes that the probability of release is 1.5 percent, whereas the benefits analysis of the final regulations assumes 1 percent. Also, the benefits analysis for the proposed regulations assumes that 3,000 bulk pesticide storage facilities could have an accidental release, whereas the benefits analysis of the final regulations assumes that 5,811 bulk pesticide facilities could have an accidental release. These differences result in an estimate of the benefits of the proposed regulations of $9.3 million to $15.6 million; and an estimate of the benefits of the final regulations of $12.2 million to $18.6 million.

References

The American Bankers Association. 1990. *Agricultural Lenders Guide to Environmental Liability*. Washington, DC.

American Business Information (ABI). 1992 (January). *Lists of 9 Million Businesses*. Omaha, NE.

Beal, Matt. 1993 (August 3). Personal communication. Department of Agriculture, Columbus, OH. (614) 466-2737.

Beal, Matt. 1991 (April 22). Personal communication. Pesticide Control Supervisor, Pesticide Regulations, Dept. of Agriculture, Columbus, OH. (614) 466-2737.

Belt, Paul. 1993 (August 4). Personal communication. Spill Coordinator for the State of Kansas Health and Environment, Topeka, KS. (913) 296-1679.

Belz, Douglas. 1991 (November 4). Personal communication. Washington Department of Natural Resources, Forest Land Management Division, Olympia, WA. (206) 753-0671.

Berven, Brad. 1991 (April 18). Personal communication. Dept. of Agriculture, Pierre, SD. (605) 773-3375.

Borem, David. 1991 (November 15). Personal communication. Woodland Research Manager, Georgia-Pacific, Savannah, GA. (912) 964-2230.

Bradley, Don. 1991 (May 1). Personal communication. American Cyanamid, Wayne, NJ. (201) 831-2867.

Breedlove, Phil. 1991 (April 18). Personal communication. Kansas Board of Agriculture, Topeka, KS. (913) 296-5395.

Broadbent, Bob. 1991 (April 30 and May 6). Personal communication. Production Planning Manager, Rohm and Haas Company, Ag Chemicals Group, Philadelphia, PA. (215) 592-2783.

Buttermore, Gary. 1993 (August 5). Personal communication. Environmental Control Department, Lincoln, NE. (402) 472-4255.

Buzicky, G., P. Liemandt, S. Grow and D. Read. 1992. "Agricultural Chemical Site Remediation and Regulations," in Pesticide Waste Management: Technology and Regulation, Bourke, J.B., A.S. Felsot, T.J. Gilding, J.K. Jensen and J.N. Sieber, editors. Americal Chemical Society, Washington, DC.

Chada, Bob. 1991 (April 25). Personal communication. Dept. of Agriculture, Oklahoma City, OK. (405) 521-3864.

Coldman, Barry. 1991 (August 28). Personal communication. Dept. of Agriculture, Bismarck, ND. (701) 224-4922.

Cole, Carl A., Jr. 1991 (Summer). "Improve Your Facility to Protect Water." *Farm Chemicals*.

Collins, Harold. 1991 (August 21). Personal communication. National Agricultural Aviation Association, Washington, DC. (202) 546-5722.

Commission of Agriculture & Forestry. Odom, Bob. 1991 (August 12). News release. Baton Rouge, Louisiana.

Cooper, K. 1991. "Effects of pesticides on wildlife." *Handbook of Pesticides Toxicology: General Principles*. Academic Press, New York, USA, pp: 463-496.

Crooker, Dave. 1991 (November 21). Personal communication. Plum Creek Timber Company, Inc., Seattle, WA. (206) 467-3600.

California Department of Pesticide Regulation (CDPR) Pesticide Illness Surveillance Program (PISP). 2001a (February 15). "Pesticide-Related Illnesses/Injuries Reported by California Physicians, Summarized by Pesticide(s), Type of Illness and Degree of Relationship, 1999."

California Department of Pesticide Regulation (CDPR) Pesticide Illness Surveillance Program (PISP). 2001b (February 15). "Pesticide-Related Illnesses/Injuries Reported by California Physicians, Summarized by Activity and Type of Exposure, 1999."

Darling, Ben. 1991 (May 2). Personal communication. Dept. of Agriculture, Lansing, MI. (517) 373-1087.

Donaldson, George. 1991 (August 28). Personal communication. Director of Regulatory Affairs, Wilbur-Ellis Company, Fresno, CA. (209) 226-1834.

Eckermann, Charles. 1991 (April 16, May 17 and August 20). Personal communication. Pesticides Bureau, Dept. of Agriculture, Des Moines, IA. (515) 281-8590.

Faulconer, Lee. 1991 (April 25, August 8). Personal communication. Washington Dept. of Agriculture, Pesticide Management Division, Olympia, WA. (206) 753-5050.

Fawcett, R.S. 1989. Agrichemical Age, October. (From EPA Draft NPRM Containment Preamble, December 9, 1991.)

Fertig, Dr. S.N. (Stan). 1991 (August 27). Personal communication. National Pesticide Impact Assessment Group, USDA.

Flowers, Charlie. 1991 (April 23). Personal communication. Plant Board, Little Rock, AR. (501) 225-1598.

Foster, Rick. 1991 (April 25). Personal communication. Division of Plant Industries, Dept. of Agriculture, Nashville, TN. (615) 360-0130.

Frank, Bob. 1991 (April 23). Personal communication. Dept. of Agriculture, Charleston, WV. (304) 348-3550.

Frieberg, Dan. 1991 (March 7). *Environmental Clean-up of Fertilizer and Agchemical Dealer Sites*, Iowa Fertilizer and Chemical Association, Des Moines, IA.

Fulton, Harry. 1991 (April 19, August 28). Personal communication. Division of Plant Industry, Department of Agriculture and Commerce, Jackson, MS. (601) 325-3390.

Gannon, Eileen. Undated. *Environmental Clean-up of Fertilizer and Agri-chemical Dealer Sites: 28 Iowa Case Studies*. Iowa Natural Heritage Foundation, Des Moines, IA.

Gilding, Tom. 1991 (May 3). Personal communication. National Agricultural Chemicals Association, Washington, DC. (202) 296-1585.

Gingery, Gary. 1991 (April 23, August 6). Personal communication. Division of Environmental Management, Department of Agriculture, Helena, MT. (406) 444-3144.

Gomersall, Jennifer. 1991 (November 15). Personal communication. Environmental Office, Louisiana-Pacific, Samoa, CA. (707) 443-7511.

Habecker, Melinda A. 1989 (September). *Environmental Contamination at Wisconsin Pesticide Mixing/Loading Facilities: Case Study, Investigation and Remedial Action Evaluation*. Wisconsin Department of Agriculture, Trade and Consumer Protection, Agriculture Resource Management Division.

Hallber, G. 1986. Agricultural Impacts on Ground Water: A Conference. National Well Association. (From EPA Draft NPRM Containment Preamble, December 9, 1991.)

Hardcastle, Rick. 1991 (August 7). Personal communication. (817) 552-9591.

Heitman, Dennis. 1991 and 1992 (April 25, February 20). Personal communication. Environmental Control Dept., Lincoln, NE. (402) 471-4210.

Howard, Dennis. 1991 (Various dates). Personal communications. U.S. Environmental Protection Agency, Office of Pesticide Programs, Environmental Fate Division/Pesticide Management and Disposal Staff, Washington, DC. (703) 557-5288.

Illinois Department of Agriculture. 1993. *Agrichemical Facility Site Contamination Study* (Executive Summary). Springfield, IL.

Illinois Fertilizer & Chemical Association (IFCA). 1991 (April). *Economic Impact on Illinois Agrichemical Facilities for Compliance with Bulk Containment Rules and Proposed Technical Standards*. St. Anne, IL.

Kammel, D.W., R.T. Noyes, G.L. Riskowski, and V.L. Hofman. 1991. *Designing Facilities for Pesticide and Fertilizer Containment*. Midwest Plan Service, Iowa State University, Ames, IA.

Keffer, Charles. 1991 (May 1, May 30, July 1, and September 2). Personal communication. Director of Environmental Affairs, Monsanto, St. Louis, MO. (314) 694-1000.

Kirby, Chris. 1991 (April 26). Personal communication. Plant Division, Dept. of Agriculture, Salem, OR. (503) 378-4152.

Kline, Duane. 1993 (August 3). Personal communication. Department of Agriculture, Madison, WI. (608) 266-7896.

Lee, Greg. 1993 (August 4). Personal communication. Emergency Response Department, FL. (904) 488-0190.

LeJeune, Larry. 1991 (April 23). Personal communication. Dept. of Agriculture and Forestry, Baton Rouge, LA. (504) 922-1234.

Leslie, Joe. 1991 (April 25). Personal communication. Plant Industries Division, Dept. of Agriculture, Jefferson City, MO. (314) 751-3359.

Lewis, Bill. 1991 (April 30 and May 1). Personal communication. Corn Herbicide Manager, ICI Americas Inc., Ag Products, Wilmington, DE. (302) 886-1159.

Licht, Alice. 1991 (August 8). Personal communication. Nebraska Fertilizer Association, Lincoln, NE. (402) 476-1528.

Long, Tom. 1989. *Groundwater Contamination in the Vicinity of Agrichemical Mixing and Loading Facilities*. Illinois Department of Public Health.

MacDonald, Brenda. 1991 (July 17). Memo and data to Dennis Howard, Biologist, Pest Management and Disposal Staff of EPA: "Summarization of Nebraska Agrichemical Spill Data." Mitchell Systems.

MacKedanz, Roger. 1993 (August 3). Personal communication. Consultant, Agronomy Service Incident Response Unit, St. Paul, MN. (612) 282-2697.

Michigan Department of Agriculture. 1989. Survey 1989. (From EPA Draft NPRM Containment Preamble, December 9, 1991.)

Michigan Department of Natural Resources (MDNR). 1991. *Pollution Emergency Alerting System (PEAS): Summary of Agricultural Related Incidents*. Compiled by B.P. Darling, Michigan Dept. of Agriculture, Pesticide and Plant Pest Management Division.

Minnesota Department of Agriculture (MDA). 1996. *Results of 1996 Soil Sampling of Pesticides on Crop Production Retailer Facilities*. Soil Sampling report, Agronomy and Plant Protection Services, Minnesota Department of Agriculture.

Morrison, P., and S. Kefer. 1991. Report on Wisconsin Pesticide Mixing and Loading Site Study. (From EPA Draft NPRM Containment Preamble, December 9, 1991.)

Morrison, Paul. 1991 (April 17). Personal communication. Director of Groundwater and Regulatory Services, Dept. of Agriculture, Trade, and Consumer Protection, Madison, WI. (608) 266-7135.

Morrison, M.L. and E.C. Meslow. 1984a. "Effects of the Herbicide Glyphosate on Bird Community Structure, Western Oregon," *Forest Science* Vol 30. pp 95-106.

Morrison, M.L. and E.C. Meslow. 1984b. "Response of Avian Communities to Herbicide-induced Vegetation Changes," *Journal of Wildlife Management* Vol 48. pp 14-22.

Musselman, Craig. 1991 (May 3). Personal communication. Du Pont Company, Ag Products, Wilmington, DE. (1-800) 441-7515.

Myrick, Chris. 1991a (April 8, July 19, July 29 and August 15). Personal communication. Legislative Affairs Director, National AgriChemical Retailers Association (NARA), Washington, DC. (202) 457-0825.

Narikawa, Susan. 1991 (April 18 and April 23). Personal communication. Dept. of Agriculture, St. Paul, MN. (612) 297-2614.

National Agricultural Aviation Association, 2001. Pesticide Use Survey Report for Agricultural Aviation.

National Weather Service, Technical Paper 40, Rainfall Frequency Atlas of the United States for Durations from 30 minutes to 24 Hours and Return Periods from 1 to 100 Years (1961).

Novak, M.T. 1991. Survey of Potential Soil and Groundwater Contamination at Licensed Pesticide Dealers in Utah. (From EPA Draft NPRM Containment Preamble, December 9, 1991.)

Owens, Mike. 1991 (August 21). Personal communication. Extension Weed Specialist, Midwest Plan Service, Iowa State University. (515) 294-1923.

Parker, Douglas. 1991 (November 6). Personal communication. Pesticide Specialist, U.S. Forest Service, Washington, DC. (202) 205-1600.

Paulson, Donald. 1992 (August 19). Personal communication. Ciba-Geigy, NC. (919) 632-2174.

Pelzer, David. 1992 (March/April). "Liability Insurance: Increase Your Coverage and Reduce Your Premium." *Solutions*.

Pesticide & Toxic Chemical News. 1991a (August 21). "EPA May Change Registration Status of Azinphos-Methyl." Volume 19, Number 42, p. 6. Food Chemical News, Inc., Washington, DC.

Pesticide & Toxic Chemical News. 1991b (August 14). "Azinphos-Methyl Linked to Kill of Half Million Fish in LA." Volume 19, Number 41, p. 22. Food Chemical News, Inc., Washington, DC.

Peterson, Jack. 1991 (April 19 and July 26). Personal communication. Dept. of Agriculture, Bismarck, ND. (701) 224-2231.

Rattner, B.A., L. Sileo and C.G. Scanes. 1982a, "Hormonal Responses and Tolerance to Cold of Female Quail following Parathion Ingestion." Pesticide Biochemistry and Physiology. Vol 18, pp 132-138.

Rattner, B.A., L. Sileo and C.G. Scanes. 1982b, "Oviposition and the plasma concentrations of LH, Progesterone and corticosterone in bobwhite quail (Colinus virginianus) fed parathion." Journal of Reproduction and Fertility. Vol 66, pp 147-155.

Renchie, Don. 1991 (April 25). Personal communication. Dept. of Agriculture, Austin, TX. (512) 463-7543.

Rogers, Bob. 1991 (April 24). Personal communication. Emergency Service Branch Chief, Dept. of Environmental Quality, Jackson, MS. (601) 961-5079.

Rogler, Debra. 1991 (April 19). Personal communication. Plant Industry Division, Dept. of Agriculture, Montpelier, VT. (802) 828-2500.

Rowdowca, John. 1991 (August 20). Personal communication. Wilbur-Ellis, Almond, WI. (715) 366-2500.

R.S. Means Company, Inc. 1992. *Means Site Work Cost Data*, 11th Annual Edition. Kingston, MA: Construction Consultants & Publishers.

R.S. Means Company, Inc. 1991a. *Building Construction Cost Data*, 49th Annual Edition. Kingston, MA: Construction Consultants & Publishers.

R.S. Means Company, Inc. 1991b. *Means Site Work Cost Data*, 10th Annual Edition. Kingston, MA: Construction Consultants & Publishers.

Scott, Dave. 1991 (April 19). Personal communication. State Chemist's Office, Indianapolis, IN. (317) 494-1492.

Simmonds, Brenda, and Dennis Brosten. 1991 (January). "The Gap." *Agrichemical Age*.

Simpson, G. Scott. 1990 (August). *The Impact of Investments in Environmental Containment on Retail Dealer Costs and Returns*. Field Programs Dept., Div. of Technology Introduction, National Fertilizer & Environmental Research Center, Tennessee Valley Authority, Muscle Shoals, AL.

Small Business Administration (SBA). 2002. Small Business Size Standards Matched to North American Industry Classification System (NAICS) (Effective February 22, 2002).

Stilwell, Doug. 1991 (November 21). Personal communication. Environmental Audit Manager, Weyerhaeuser, Tacoma, WA. (206) 924-6825.

Striley, Dave. 1991 (November 15). Personal communication. Manager, Forest Product Programs, Champion International Corp., Hamilton, OH. (515) 868-4261.

Tatman, Mike. 1991 (April 18). Personal communication. Farm Land Insurance Company, Des Moines, IA.

Taylor, A.G. 1991 (May 1). Personal communication. Illinois EPA, Office of Chemical Safety. (217) 785-0830.

Taylor, A.G. Undated. *Testimony in Support of Regulatory Proposals Regarding Agrichemical Storage and Handling Facilities*. Exhibit J—IEPA Agrichemical Facility Investigations Involving Pesticide Contamination of Private Well Waters, Exhibit K—Frequency of Pesticides Detected in Private and Community Wells Near Agrichemical Handling Sites. Illinois Environmental Protection Agency.

Uram, Joe. 1991 (April 25 and July 29). Personal communication. Pesticide Case Reviewer, Plant Industries Division, Dept. of Agriculture, Harrisburg, PA. (717) 787-4843.

U.S. Department of Commerce, Bureau of the Census. 2002. North American Industry Classification System (NAICS)–Revisions for 2002. Available online at http://www.census.gov/epcd/naics02/.

U.S. Department of Commerce, Bureau of the Census. Various years. *Census of Wholesale Trade*. U.S. Government Printing Office, Washington, DC.

U.S. Department of Homeland Security. 2005. National Response Center. U.S. Coast Guard.

U.S. Department of Labor, Bureau of Labor Statistics. Consumer Price Index, 2005 http://www.bls.gov

U.S. Environmental Protection Agency. 2005a *EPA Staff Research on Container and Containment Regulation*.

U.S. Environmental Protection Agency. 2005b Economic Analysis of The Final Pesticide Container Design and Residue Removal Standards

U.S. Environmental Protection Agency. 2005c. National Primary Drinking Water Regulations. Consumer Fact Sheet on: Alachlor. Office of Ground Water and Drinking Water.

U.S. Environmental Protection Agency. 2002 (August). *Pesticides Industry Sales Usage 1998 and 1999 Market Estimates*. Biological and Economic Analysis Division, Office of Pesticide Programs.

U.S. Environmental Protection Agency. 2002 (August). *Guidelines for Preparing Economic Analyses*. Office of the Administrator. EPA 240-R-00-003.

U.S. Environmental Protection Agency. 1999a (October). "Standards for Pesticide Containers and Containment; Proposed Rule Supplemental Notice." *Federal Register* 64:56917-56944.

U.S. Environmental Protection Agency (EPA). 1999b (October). "Standards for Pesticide Containers and Containment; Proposed Rule Supplemental Notice." *Federal Register* 64:569917-56944.

U.S. Environmental Protection Agency (EPA). 1996. Pretreatment Standards and New Source Performance Standards for Pesticide Formulation, Packaging and Repackaging.

U.S. Environmental Protection Agency. 1994 (February) 40 CFR Parts 156 and 165 Standards for Pesticide Containers and Containment. Proposed Rule *Federal Register* Vol. 26, No. 29

U.S. Environmental Protection Agency. 1993a (September). "Regulatory Impact Analysis: Standards for Pesticide Containment Structures Under the Federal Insecticide, Fungicide and Rodenticide Act as Amended, 1988."

U.S. Environmental Protection Agency. 1993b (September 7). Personal communication. Bob Buloski, OPPTS\Field Operations Division\Certification and Training Branch. (703) 305-7371.

U.S. Environmental Protection Agency. 1992 (September). *State of the States Report: Pesticide Storage, Disposal and Transportation.* Office of Prevention, Pesticides and Toxic Substances. EPA 734-R-92-012.

U.S. Environmental Protection Agency. 1991 (December 9). Draft Notice of Proposed Rulemaking (NRPM) (40 CFR Part 165/156).

U.S. Environmental Protection Agency, *Code of Federal Regulations.* 1990 (July 1). Title 40, Part 165. Office of the Federal Register National Archives and Records Administration.

Appendix A: Methodology for Calculating Annualized Compliance Costs

The analysis of the bulk pesticide containment standards calculates costs across a 20-year period. Affected facilities incur some compliance costs only once (initial and capital costs), other costs annually (operations and maintenance), and other costs at regular future intervals (intermittent costs). We therefore need to account for the time dimension of this analysis.

We calculate the annual cost of complying with the containment standards by:

- Calculating the non-discounted cost in each year of the 20-year period;
- Calculating the present discounted value of the resulting stream of costs; and
- Annualizing this present discounted value.

Facilities will have 3 years to come into compliance with regulations under the containment regulations. We assume that initial and capital costs associated with the containment regulations will be incurred beginning at the end of the third year. Operation and maintenance costs will be incurred in each year beginning in year 4 and continuing to year 20. Intermittent costs will be incurred in every fifth year after the end of the compliance period (years 8, 13, and 18). To calculate the present discounted value of the costs of a regulation, all costs are discounted back to the beginning of the first year of the 20-year period.

The costs incurred in a single year are the sum of initial, capital, operation and maintenance, and intermittent costs, if any of the four cost types occur in that year. If:

- *INTLn* denotes the initial cost of complying with the regulation in the *n*th year (*n*=1, ..., 20),
- *CAPn* denotes the capital cost of complying with the regulation in the *n*th year,
- *OMn* denotes the operation and maintenance cost of complying with the regulation in the *n*th year,
- *INTERn* denotes the intermittent cost of complying with the regulation in the *n*th year, and
- *N* denotes the number of facilities out of compliance with the regulation annually,

Then the cost of complying with the regulation in the *n*th year is:

$$(INTLn + CAPn + OMn + INTERn) * N.$$

Regulatory costs, however, may differ for facilities in different size classes, and the cost analysis attempts to capture those differences whenever possible. For example, it is more expensive for a large agricultural refiller to install a new outdoor bulk liquid storage structure with a containment pad than a small-small agricultural refiller because the large facility requires a storage area with more square footage, including a larger containment pad. This results in substantially greater compliance costs for the average large agricultural refiller than the average small-small one.

We display the 20-year schedules of facility-level, non-discounted costs associated with the containment standards for the average agricultural refiller and commercial (aerial and ground) applicator in each size class in Appendix B.

The present discounted value *(pdv)* of the 20-year stream of compliance costs *(CC)* associated with the *i*th regulation for the average facility in the *j*th size class is:

$$CC_{ij}^{pdv} = \sum_{n=1}^{20} \frac{CC_{ijn}}{(1+d)^n}$$

where *d* is the discount rate. We considered two discount rates: 3 percent and 7 percent.

For example, costs to install a new outdoor secondary containment structure for bulk liquids begin in year 3 and continue through year 20. In year 3, there are capital costs associated with the construction of the structure; in subsequent years there are operating and maintenance costs associated with the structure (years 4-20) and intermittent costs associated with the repair of the structure (years 8, 13, and 18). The (undiscounted) compliance cost associated with new bulk liquid outdoor containment structures for a small-small agricultural refiller, for example, in year 3 is $5,610. The (undiscounted) compliance cost associated with new bulk liquid outdoor containment structures in subsequent years 4-7, 9-12, 14-17, and 19-20 is $1,160. The (undiscounted) compliance cost associated with the same structures in intermittent years 8, 13, and 18 is $1,220. Table B.1 in Appendix B details each of the non-discounted regulatory compliance costs for the entire 20-year policy scenario period. Using a 3 percent discount rate, and discounting back to the beginning of year 1, the present discounted value of the stream of costs associated with the regulations requiring a new bulk liquid outdoor containment structure for a small-small agricultural refiller is $19,234 and the annualized cost of this at the 3 percent discount rate is $1,255.

The present discounted value of the cost of complying with a regulation was then annualized over the 20-year period, using two interest rates *(r)* that were assumed to be the same as the two discount rates used to obtain present discounted values (that is, when the discount rate was assumed to be 3 percent, the interest rate was also assumed to be 3 percent, and similarly for 7 percent). We calculated the annualized cost of complying with the *i*th regulation for the average facility in the *j*th size class, using interest rate *r,* as:[72]

$$CC_{ij}^{ann.} = \left(\frac{r}{[1+r] * [1-(1+r)^{-20}]} \right) * CC_{ij}^{pdv}$$

We show the estimated facility-level annual cost of complying with the containment standards for new structures in each facility size class in Tables I.1-I.4. We display the industry-wide cost of complying with the containment standards for existing structures in each facility size class in Tables I.1-I.4. We assume both a discount rate and an interest rate of 3 and 7 percent.

[72] The procedure for annualization is based on the guidelines for economic analyses that are published by EPA (EPA, 2000)

Appendix B: Non-Discounted Facility-Level Costs of Compliance for the Bulk Pesticide Containment Standards

Table B.1. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for New Structures, Agricultural Refillers (2005$)

Compliance Cost Item [b]	Year [a]							
	3	4	5	6	7	8	9	10
Secondary Containment - Bulk Liquid/Outdoor								
Small-Small	5600	1160	1160	1160	1160	1210	1160	1160
Medium-Small	10300	1540	1540	1540	1540	1660	1540	1540
Large-Small/Large [c]	18250	2760	2760	2760	2760	2890	2760	2760
Secondary Containment - Bulk Liquid/Indoor								
Small-Small	2170	740	740	740	740	790	740	740
Medium-Small	2500	1050	1050	1050	1050	1170	1050	1050
Large-Small/Large [c]	3780	1490	1490	1490	1490	1620	1490	1490
Secondary Containment - Bulk Dry, 1 Container								
Small-Small [d]	na	na	na	na	na	na	na	na
Medium-Small	5230	850	850	850	850	950	850	850
Large-Small/Large [c]	5230	850	850	850	850	950	850	850

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).

[b] Cost taken from Table 4.2

[c] Large-small and large facilities are assumed to incur the same costs.

[d] No costs are estimated for small-small refiller facilities, because it is assumed that only medium-small, large-small, and large facilities have outdoor bulk dry storage.

Table B.1 (Continued). Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for New Structures, Agricultural Refillers (2005$)

Compliance Cost Item [b]	Year [a]									
	11	12	13	14	15	16	17	18	19	20
Secondary Containment - Bulk Liquid/Outdoor										
Small-Small	1160	1160	1210	1160	1160	1160	1160	1210	1160	1160
Medium-Small	1540	1540	1660	1540	1540	1540	1540	1660	1540	1540
Large-Small/Large [c]	2760	2760	2890	2760	2760	2760	2760	2890	2760	2760
Secondary Containment - Bulk Liquid/Indoor										
Small-Small	740	740	790	740	740	740	740	790	740	740
Medium-Small	1050	1050	1170	1050	1050	1050	1050	1170	1050	1050
Large-Small/Large	1490	1490	1620	1490	1490	1490	1490	1620	1490	1490
Secondary Containment - Bulk Dry, 1 Container										
Small-Small	na [d]	na	na	na	na	na	na	na	na	na
Medium-Small	850	850	950	850	850	850	850	950	850	850
Large-Small/Large	850	850	950	850	850	850	850	950	850	850

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).

[b] Costs taken from Table 4.2.

[c] Large-small and large facilities are assumed to incur the same costs.

[d] No costs are estimated for small-small refiller facilities, because it is assumed that only medium-small, large-small, and large facilities have outdoor bulk dry storage.

Table B.2. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for New Structures, Commercial Applicators (2005$)

Compliance Cost Item [b]	Year [a]							
	3	4	5	6	7	8	9	10
AERIAL APPLICATORS								
Secondary Containment - Bulk Liquid/Outdoor								
Small-Small	5600	1160	1160	1160	1160	1210	1160	1160
Medium-Small	10300	1550	1550	1550	1550	1670	1550	1550
Large-Small	18250	2790	2790	2790	2790	2920	2790	2790
GROUND APPLICATORS [c]								
Secondary Containment - Bulk Liquid/Indoor								
Small-Small	na	na	na	na	na	na	na	na
Medium-Small	na	na	na	na	na	na	na	na
Large-Small	10300	1550	1550	1550	1550	1670	1550	1550

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).
[b] Costs taken from Table 4.2.
[c] Ground applicators are considered to be comprised of all large-small facilities. For this analysis, ground applicators have been assigned the same costs as those estimated for medium-small agricultural refillers.

Table B.2 (Continued). Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for New Structures, Commercial Applicators (2005$)

Compliance Cost Item [b]	Year [a]									
	11	12	13	14	15	16	17	18	19	20
AERIAL APPLICATORS										
Secondary Containment - Bulk Liquid/Outdoor										
Small-Small	1160	1160	1210	1160	1160	1160	1160	1210	1160	1160
Medium-Small	1550	1550	1670	1550	1550	1550	1550	1670	1550	1550
Large-Small	2790	2790	2920	2790	2790	2790	2790	2920	2790	2790
GROUND APPLICATORS [c]										
Secondary Containment - Bulk Liquid/Indoor										
Small-Small	na	na	na	na	na	na	na	na	na	na
Medium-Small	na	na	na	na	na	na	na	na	na	na
Large-Small	1550	1550	1670	1550	1550	1550	1550	1670	1550	1550

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).
[b] Costs taken from Table 4.2.
[c] Ground applicators are considered to be comprised of all large-small facilities. For this analysis, ground applicators have been assigned the same costs as those estimated for medium-small agricultural refillers.

Table B.3. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for New Structures, Agricultural Refillers and Commercial Applicators

Compliance Cost Item [b]	Year [a]							
	3	4	5	6	7	8	9	10
Containment Pads - Outdoor Scenario 1 [c]								
Small-Small	5850	1190	1190	1190	1190	1230	1190	1190
Medium-Small	16100	2210	2210	2210	2210	2260	2210	2210
Large-Small/Large	34060	5100	5100	5100	5100	5170	5100	5100
Containment Pads - Outdoor Scenario 2 [c]								
Small-Small	6600	1190	1190	1190	1190	1230	1190	1190
Medium-Small	18310	2210	2210	2210	2210	2260	2210	2210
Large-Small/Large	34060	5100	5100	5100	5100	5170	5100	5100
Containment Pads - Indoor Scenario 1 [d]								
Small-Small	6860	740	740	740	740	780	740	740
Medium-Small	18730	1100	1100	1100	1100	1150	1100	1100
Large-Small/Large	50570	1490	1490	1490	1490	1560	1490	1490
Containment Pads - Indoor Scenario 2 [d]								
Small-Small	8790	740	740	740	740	780	740	740
Medium-Small	23970	1100	1100	1100	1100	1150	1100	1100
Large-Small/Large	53840	1490	1490	1490	1490	1560	1490	1490

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).

[b] Costs taken from Table 4.2.

[c] Outdoor Scenario 1 evaluates the capital costs of facilities that must also have secondary containment of bulk storage containers. Scenario 2 estimates capital costs to facilities that require only a new containment pad, including the costs of a pump and a hose. Capital costs under Scenario 1 are lower than Scenario 2 because the costs of a portable pump and hose have already been accounted for within the overall secondary containment costs under Scenario 1.

[d] Indoor Scenario 1 estimates capital costs for pads built over existing concrete floors. Scenario 2 estimates capital costs for facilities where the existing concrete floor is removed prior to construction of the containment pad.

Table B.3 (Continued). Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for New Structures, Agricultural Refillers and Commercial Applicators

Compliance Cost Item [b]	Year [a]									
	11	12	13	14	15	16	17	18	19	20
Containment Pads - Outdoor Scenario 1 [c]										
Small-Small	1190	1190	1230	1190	1190	1190	1190	1230	1190	1190
Medium-Small	2210	2210	2260	2210	2210	2210	2210	2260	2210	2210
Large-Small/Large	5100	5100	5170	5100	5100	5100	5100	5170	5100	5100
Containment Pads - Outdoor Scenario 2 [c]										
Small-Small	1190	1190	1230	1190	1190	1190	1190	1230	1190	1190
Medium-Small	2210	2210	2260	2210	2210	2210	2210	2260	2210	2210
Large-Small/Large	5100	5100	5170	5100	5100	5100	5100	5170	5100	5100
Containment Pads - Indoor Scenario 1 [d]										
Small-Small	740	740	780	740	740	740	740	780	740	740
Medium-Small	1100	1100	1150	1100	1100	1100	1100	1150	1100	1100
Large-Small/Large	1490	1490	1560	1490	1490	1490	1490	1560	1490	1490
Containment Pads - Indoor Scenario 2 [d]										
Small-Small	740	740	780	740	740	740	740	780	740	740
Medium-Small	1100	1100	1150	1100	1100	1100	1100	1150	1100	1100
Large-Small/Large	1490	1490	1560	1490	1490	1490	1490	1560	1490	1490

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).

[b] Costs taken from Table 4.2.

[c] Outdoor Scenario 1 evaluates the capital costs of facilities that must also have secondary containment of bulk storage containers. Scenario 2 estimates capital costs to facilities that require only a new containment pad, including the costs of a pump and a hose. Capital costs under Scenario 1 are lower than Scenario 2 because the costs of a portable pump and hose have already been accounted for within the overall secondary containment costs under Scenario 1.

[d] Indoor Scenario 1 estimates capital costs for pads built over existing concrete floors. Scenario 2 estimates capital costs for facilities where the existing concrete floor is removed prior to construction of the containment pad.

Table B.4. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for Existing Structures, Small-Small Facilities

Compliance Cost Item [b]	Year [a]							
	3	4	5	6	7	8	9	10
AGRICULTURAL REFILLERS								
Secondary Containment - Bulk Liquid/Outdoor								
Initial	740	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30
Intermittent	0	0	0	0	0	40	0	0
Secondary Containment - Bulk Dry/Outdoor								
Initial	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Overhead & Maintenance	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Intermittent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
COMMERCIAL APPLICATORS								
Secondary Containment - Bulk Liquid/Outdoor								
Initial	740	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30
Intermittent	0	0	0	0	0	40	0	0
REFILLERS AND APPLICATORS								
Containment Pads - Outdoor (Scenarios 1&2)								
Capital	1660	0	0	0	0	0	0	0
Initial	80	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30
Intermittent	0	0	0	0	0	30	0	0
Container Anchoring (Plastic and Steel)								
Initial	580	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).

[b] Costs taken from Table 4.11. Facility compliance with the standards for existing containment structures is not uniform across facilities. Different facilities will have to comply to the existing containment standards to varying degrees, incurring some or all of the capital, initial, overhead and maintenance, and intermittent costs associated with each standard. Because compliance and the associated costs of compliance do not accrue to facilities uniformly, we present the capital, initial, overhead and maintenance, and intermittent costs separately.

Table B.4 (Continued). Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for Existing Structures, Small-Small Facilities

Compliance Cost Item [b]	Year [a]									
	11	12	13	14	15	16	17	18	19	20
AGRICULTURAL REFILLERS										
Secondary Containment - Bulk Liquid/Outdoor										
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30
Intermittent	0	0	40	0	0	0	0	40	0	0
Secondary Containment - Bulk Dry/Outdoor										
Initial	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Overhead & Maintenance	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Intermittent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
COMMERCIAL APPLICATORS										
Secondary Containment - Bulk Liquid/Outdoor										
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30
Intermittent	0	0	40	0	0	0	0	40	0	0
REFILLERS AND APPLICATORS										
Containment Pads - Outdoor (Scenarios 1&2)										
Capital	0	0	0	0	0	0	0	0	0	0
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30
Intermittent	0	0	30	0	0	0	0	30	0	0
Container Anchoring (Plastic and Steel)										
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).

[b] Costs taken from Table 4.11. Facility compliance with the standards for existing containment structures is not uniform across facilities. Different facilities will have to comply to the existing containment standards to varying degrees, incurring some or all of the capital, initial, overhead and maintenance, and intermittent costs associated with each standard. Because compliance and the associated costs of compliance do not accrue to facilities uniformly, we present the capital, initial, overhead and maintenance, and intermittent costs separately.

Table B.5. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for Existing Structures, Medium-Small Facilities

Compliance Cost Item [b]	Year [a]							
	3	4	5	6	7	8	9	10
AGRICULTURAL REFILLERS								
Secondary Containment - Bulk Liquid/Outdoor								
Initial	740	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30
Intermittent	0	0	0	0	0	110	0	0
Secondary Containment - Bulk Dry/Outdoor								
Initial	0	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30
Intermittent	0	0	0	0	0	110	0	0
COMMERCIAL APPLICATORS								
Secondary Containment - Bulk Liquid/Outdoor								
Initial	740	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30
Intermittent	0	0	0	0	0	110	0	0
REFILLERS AND APPLICATORS								
Containment Pads - Outdoor (Scenarios 1& 2)								
Capital	2560	0	0	0	0	0	0	0
Initial	80	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30
Intermittent	0	0	0	0	0	60	0	0
Container Anchoring (Plastic and Steel)								
Initial	580	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).

[b] Costs taken from Table 4.11. Facility compliance with the standards for existing containment structures is not uniform across facilities. Different facilities will have to comply to the existing containment standards to varying degrees, incurring some or all of the capital, initial, overhead and maintenance, and intermittent costs associated with each standard. Because compliance and the associated costs of compliance do not accrue to facilities uniformly, we present the capital, initial, overhead and maintenance, and intermittent costs separately.

Table B.5 (Continued). Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for Existing Structures, Medium-Small Facilities

Compliance Cost Item [b]	Year [a]									
	11	12	13	14	15	16	17	18	19	20
AGRICULTURAL REFILLERS										
Secondary Containment - Bulk Liquid/Outdoor										
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30
Intermittent	0	0	110	0	0	0	0	110	0	0
Secondary Containment - Bulk Dry/Outdoor										
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30
Intermittent	0	0	110	0	0	0	0	110	0	0
COMMERCIAL APPLICATORS										
Secondary Containment - Bulk Liquid/Outdoor										
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30
Intermittent	0	0	110	0	0	0	0	110	0	0
REFILLERS AND APPLICATORS										
Containment Pads - Outdoor (Scenarios 1& 2)										
Capital	0	0	0	0	0	0	0	0	0	0
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30
Intermittent	0	0	60	0	0	0	0	60	0	0
Container Anchoring (Plastic and Steel)										
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).

[b] Costs taken from Table 4.11. Facility compliance with the standards for existing containment structures is not uniform across facilities. Different facilities will have to comply to the existing containment standards to varying degrees, incurring some or all of the capital, initial, overhead and maintenance, and intermittent costs associated with each standard. Because compliance and the associated costs of compliance do not accrue to facilities uniformly, we present the capital, initial, overhead and maintenance, and intermittent costs separately.

Table B.6. Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for Existing Structures, Large-Small and Large Facilities

Compliance Cost Item [b]	Year [a]							
	3	4	5	6	7	8	9	10
AGRICULTURAL REFILLERS								
Secondary Containment - Bulk Liquid/Outdoor								
Initial	740	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30
Intermittent	0	0	0	0	0	140	0	0
Secondary Containment - Bulk Dry/Outdoor								
Initial	0	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30
Intermittent	0	0	0	0	0	100	0	0
COMMERCIAL APPLICATORS								
Secondary Containment - Bulk Liquid/Outdoor								
Initial	740	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30
Intermittent	0	0	0	0	0	140	0	0
REFILLERS AND APPLICATORS								
Containment Pads - Outdoor (Scenarios 1&2)								
Capital	4870	0	0	0	0	0	0	0
Initial	80	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30
Intermittent	0	0	0	0	0	70	0	0
Container Anchoring (Plastic and Steel)								
Initial	580	0	0	0	0	0	0	0
Overhead & Maintenance	0	30	30	30	30	30	30	30

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).

[b] Costs taken from Table 4.11. Facility compliance with the standards for existing containment structures is not uniform across facilities. Different facilities will have to comply to the existing containment standards to varying degrees, incurring some or all of the capital, initial, overhead and maintenance, and intermittent costs associated with each standard. Because compliance and the associated costs of compliance do not accrue to facilities uniformly, we present the capital, initial, overhead and maintenance, and intermittent costs separately.

Table B.6 (Continued). Non-Discounted Costs of Complying with the Bulk Pesticide Containment Standards for Existing Structures, Large-Small and Large Facilities

Compliance Cost Item [b]	Year [a]									
	11	12	13	14	15	16	17	18	19	20
AGRICULTURAL REFILLERS										
Secondary Containment - Bulk Liquid/Outdoor										
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30
Intermittent	0	0	140	0	0	0	0	140	0	0
Secondary Containment - Bulk Dry/Outdoor										
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30
Intermittent	0	0	100	0	0	0	0	100	0	0
COMMERCIAL APPLICATORS										
Secondary Containment - Bulk Liquid/Outdoor										
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30
Intermittent	0	0	140	0	0	0	0	140	0	0
REFILLERS AND APPLICATORS										
Containment Pads - Outdoor (Scenarios 1& 2)										
Capital	0	0	0	0	0	0	0	0	0	0
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30
Intermittent	0	0	70	0	0	0	0	70	0	0
Container Anchoring (Plastic and Steel)										
Initial	0	0	0	0	0	0	0	0	0	0
Overhead & Maintenance	30	30	30	30	30	30	30	30	30	30

[a] The period of analysis for the bulk pesticide containment standard cost analysis is 20 years. We assume that there is a 3-year compliance period. Compliance costs and initial costs are incurred at the end of the third year. Overhead and maintenance costs occur in each year after the compliance period (years 4-20). Intermittent costs occur every 5 years after the compliance period (years 8, 13, and 18).

[b] Costs taken from Table 4.11. Facility compliance with the standards for existing containment structures is not uniform across facilities. Different facilities will have to comply to the existing containment standards to varying degrees, incurring some or all of the capital, initial, overhead and maintenance, and intermittent costs associated with each standard. Because compliance and the associated costs of compliance do not accrue to facilities uniformly, we present the capital, initial, overhead and maintenance, and intermittent costs separately.

Appendix C: Comparison of Critical and State Containment Standards

State	Standard	Comment Source
TOPIC: Material Critical: Rigid, watertight (no earth, asphalt).		
CO	Permeability $1x10^{-7}$; material compatible w. pesticide, resist corrosion; rigid steel, concrete or synthetic.	1994 regs., p.5
IL	Steel, concrete, solid masonry; $1x10^{-6}$ (constructed), $1x10^{-6}$ (maintained).	1990 Dept. of Ag. regs, p.10
IN	Steel, poured concrete, solid masonry; full hydrostatic head of discharged liq. + wt. of construction material.	1992 IN regs/rules, p. 13
IA	Concrete, steel or impervious material, compatible w. pesticides stored/shipped;$1x10^{-6}$ (constructed), $1x10^{-6}$ (maintained).	1991 Regs. Dept. of Ag. Stewardship, p. 2
KS	Material of sufficient thickness & density, composition to confine discharged liquid or solid material; compatible with pesticides and conditions of storage.	1993 KS Board of Ag. rules, p. 1
LA	Solidly constructed of impervious material sufficient to contain leaks, spills, accumulated pesticides/rinsates.	1984 Dept. Ag. & Forestry regs., p.42
MI	Steel, reinforced concrete, solid masonry, precast concrete modules.	1982 MI Dept. Ag. regs. p. 5
MN	Ferrous metal, inorganic soil, stainless steel, reinforced concrete, solid masonry; full hydrostatic head.	1989 rules, Dept. Ag., p. 12
MO	Suitable material compatible w. specs. of product being stored; synthetic liner option; $1x10^{-7}$.	1992 Dept. Nat. Rscs. rules, p. 82.
NE	Concrete or solid masonry lined vault/synthetic, metal liner; tank inside another tank is acceptable.	1992 rules/regs., Dept. Envir. Qual., p. 9
NH	Reinforced concrete or other rigid material; full hydrostatic head; hydraulic conductivity 10^{-6} interim, $1x10^{-7}$ new.	Rules/regs. p. 6
ND	Material sufficient to contain spills, discharges, leaks.	Telcon Barry Coleman 701 328 4756.
OH	Sufficient thickness, density, composition to contain spills or discharges.	1984 OH Pesticide Law
SD	Concrete, excluding blocks, bricks of sufficient thickness, strength; hydrostatic head. Steel, or cross-linked polyolefin.	Pesticide Rules, p. 35, 43, 44.
VT	Earth, steel, concrete or solid masonry to withstand hydrostatic pressure; liners can be used.	1991 Dept. Ag. regs. p. 65
WA	Steel, poured reinforced concrete, solid masonry, precast concrete; solid masonry; hydrostatic capacity; sealed to prevent leaks.	1997 Dept. Ag. rules, p. 3
WV	Constructed w. 2ndary containment to prevent discharge, facilitate recovery; sufficient thickness, density, composition. Liquid tight.	Title 61 Legislative Rules p. 5
WI	Walls of earth, steel, concrete or solid masonry; full hydrostatic head. Earth walls must be lined to meet specific requirements.	Admin. Code Ag./Trade & Consumer Protection, p. 695

State	Standard	Comment Source
TOPIC: Appurtenances Critical: Protected against damage.		
CO	Constructed, installed, maintained to prevent discharge of liq. pesticide; resistant to corrosion, puncture, cracking.	1994 Regs., p. 7
IL	Designed to handle operating and other foreseeable mechanical stresses.	1990 Dept. Ag. regs. p. 14
IN	Designed to handle operating stresses (static head, pressure build-up) and other mechanical stresses.	1992 IN rules/regs. p. 7
IA	Containers, pipes, valves protected against reasonably foreseeable risks of damage by moving vehicles.	1991 regs. Dept. of Ag., p. 3
KS	None	Telcon Greg Krissek 913 296 0086
LA	Must all be within 2ndary containment area.	Telcon Larry Lejeune 504 925 3713
MI	Containers, pipes, valves protected against reasonably foreseeable risks of damage by moving vehicles.	1992 regs. MI Dept. Ag., p. 6
MN	Containers, pipes, valves protected against reasonably foreseeable risks of damage by moving vehicles.	1989 regs. Dept. of Ag., p. 9
MO	Able to handle operating stresses, hydrostatic head, pressure build-up, mechanical stresses, moving vehicles; located within containment.	1992 Dept. Nat. Rscs. rules, p. 82
NE	Containers, pipes, valves protected against reasonably foreseeable risks of damage by moving vehicles.	1992 rules/regs. Dept. Env. Qual. p. 17
OH	Containers, pipes, valves protected against reasonably foreseeable risks of damage by moving vehicles.	Rules/regs. p. 8
ND	No specific regs.	Telcon Barry Coleman 701 328 4756
OH	No	Telcon Jim Belt 614 728 6987
SD	No specific regs.	Telcon Brad Barron 605 773 3724
VT	Designed to handle operating stresses (static head, pressure build-up) and other mechanical stresses from pumps, compressors and moving vehicles.	1991 regs., Dept. of Ag. p. 62, 64
WA	Containers, pipes, valves protected against reasonably foreseeable risks of damage by moving vehicles.	1997 rules Dept. Ag. p. 5
WV	No specifics, but recommend lock on gate valve to protect drains in secondary containment.	Telcon Doug Hudson 304 558 2209
WI	Should not be located where they can be run over or backed into. Protected, e.g., by overhead suspension, large curb, RR ties or dike wall.	Admin. Code Ag./Trade & Consumer Protection, p. 9
TOPIC: Inspection Critical: Monthly		
CO	Visually inspected at least once a week.	1994 regs., p. 11
IL	At least once a week	1990 Dept. Ag. regs. p. 17
IN	2ndary containment: intervals of not > 6 months; valves, appurtenances weekly; vents at least monthly.	1992 IN regs./rules, p. 16
IA	Routine inspection against concrete cracks.	1991 regs. part of Ag/Land Stewardship Law p. 6
KS	None	Telcon Gary Krissek 913 296 0086

State	Standard	Comment Source
LA	Use internal checklist; annual inspections; more frequently when circumstances warrant.	Telcon Larry Lejeune 504 925 3763
MI	Regular inspections/maintenance on a monthly basis. MDA staff conducts annual official inspection.	1992 regs, MDA p. 8
MN	Container/appurtenances weekly; containment area monthly.	1989 Dept. Ag. rules p. 17
MO	Inspection before permit issued; no other inspection requirement.	Telcon Roger Korneberg 573 526 5804.
NE	Weekly facility inspections; monthly bulk container measurements; quarterly inventory reconciliation of pesticides.	1992 rules/regs. p. 18 Dept. Envir. Qual.
NH	Monthly when pesticides stored/handled; when no suitable means to observe leaks, reconcile pesticide contents weekly.	Rules/regs. p. 10/12
ND	None	Telcon Barry Coleman 701 328 6987
OH	None	Telcon Jim Belt 614 728 6987
SD	Inspection of new, existing, or altered storage facility prior to permit; biennial or more frequent as determined at time of permit.	Telcon Brad Barvan 605 773 3724
VT	Valves, appurtenances weekly; contents of bulk storage measured weekly; containment monthly.	1991 regs., Dept. Ag. p. 67
WA	Containers/appurtenances monthly when in use.	1997 Dept. Ag. p. 10
WV	Containers/appurtenances at least weekly; 2ndary containment and operational areas at least monthly.	Title 61 Legislative rules p. 8
WI	2ndary containment inspected at intervals not greater than 12 months.	Admin. Code Ag./Trade & Consumer Protection, p. 9
TOPIC: Spill Cleanup Critical: End of day at latest		
CO	Promptly recovered.	1994 regs. p. 6
IL	Daily cleanup.	1990 Dept. of Ag. regs. p. 18
IN	Promptly recovered.	1993 IN regs./rules p. 11
IA	Promptly recovered to the maximum extent possible.	1991 regs. Dept. Ag. Land Stew. p. 2
KS	None	Telcon Gary Krissek 913 296 0086
LA	Requirement to maintain area in an orderly fashion, end of work shift, end of day.	Telcon Larry Lejeune 504 925 3763
MI	Manually activated pump/sump and containment area cleanup within 18 hours of accumulation.	1992 regs. MDA p. 7
MN	Recovered ASAP - must be used, stored or disposed.	1989 rules Dept. Ag. p. 14
MO	Recovered promptly.	1992 Dept. Nat. Rscs. rules p. 14
NE	Contaminated material shall be promptly recovered and used or disposed.	1992 rules/regs. p. 16 Dept. Env. Qual. p. 16
NH	Clean up ASAP; traveling spills or leaks cleaned immediately.	Rules/regs. p. 15
ND	Immediately.	Telcon Barry Coleman 701 328 4756
OH	Follow building and product label instructions.	Telcon Jim Belt 614 728 6987

State	Standard	Comment Source
SD	Immediately recovered using absorbent materials, pumps or similar means	Telcon Brad Barron 605 773 3724
VT	Discharges promptly recovered.	1991 regs. Dept. Ag. p. 64
WA	Dry pesticide spills/promptly cleaned & recovered. Bulk spills immediately recovered.	1997 rules Dept. Ag. p. 5, 9
WV	Discharges immediately and fully recovered in operational area.	Title 61 Legislative rules p. 3
WI	Discharges at storage facility promptly recovered.	Admin. Code Ag./Trade & Consumer Protection, p. 697
TOPIC: Liquid Bulk Critical: 100% of Largest Container		
CO	110% indoor	1994 Regs p. 4
IN	100% I/O (indoor/outdoor) + 6" freeboard if outdoors	Reg 2/92
IL	100% + 6" freeboard (25-yr/24-hr) + displaced volume	SoS Report - 92
IA	100%/110% I/O + displaced volume	SoS Report - 92
KS	110% outdoor; suitable design indoor	Fitz - 93 Sub-std for indoors
LA	110% if outdoor	SoS Report - 92 Indoor?
MI	100%/110% I/O + displaced volume + 6" freeboard if outdoor	Fitz - 93
MN	110%/125% I/O + displaced volume	SoS Report - 92
MO	110%/125% I/O + displaced volume	Fitz - 93
NE	110% + displaced volume, + 25-yr/24-hr storm if outside	SoS Report - 92
NH	Interim:110% of the largest unprotected from precipitation/100% protected; when interim period expires: 125% unprotected, 100% protected	regs/rules p. 11
ND	110%/120% I/O + max. rain accumulation of 25% of containment capacity or 7 days	Fitz - 93
OH	110% outdoor, suitable measures for indoor	Fitz - 93 May be sub-std for indoor
SD	110% + displaced volume	Fitz - 93
VT	110% + displaced volume	SoS Report - 92
WA	Indoor: 100% + displaced volume; outdoor: 125% + displaced volume	1997 rules, Dept. of Ag., p.3
WV	Outdoor: 110% of largest + displaced vol. of tanks, appurtenances, etc. Indoor: 100% + displaced, etc., as with outdoor	SoS Report - 92
WI	100%/125% I/O + displaced volume	Fitz - 93
TOPIC: Dry Bulk Critical: Protected from precipitation; 6" curb 2' away		
MO	Pesticides stored inside/surface water runoff diverted away from storage/individual catchment basins.	1992 Dept. of Nat. Rscs. rules p. 83
NE	None.	

State	Standard	Comment Source
NH	Contain 100% of volume of largest stationary bulk container.	rules/regs. p. 12
ND	6" curb, 3' away from containers; roof or tarp. against rain. Concrete/impervious floor/pallets on raised platform.	1992 D. Ag. p. 34
OH	Follow building or product label instructions.	Telcon Jim Belt 614 728 6987
SD	No specifics; no distinction between wet/dry (110% capacity indirectly covers dry bulk).	Telcon Brad Barron 605 773 3724
VT	Roof/tarp/pallets or raised concrete platform.	1991 Dept. Ag. p.62
WA	Pallets or raised platform with roof/tarp. M/L done on a paved surface of size/design to contain and allow for spill collection.	1997 rules Dept. Ag. p.8
WV	Tarps or other suitable synthetic material to withstand all foreseeable loading conditions/compatible w. pesticides.	Title 61 Legislative rules p. 3
WI	Roof/tarp/raised on pallets or concrete platform.	Admin. Code Consumer Protection, p. 698
TOPIC: Pad Capacity Critical: At least 750 gallons		
CO	150% of largest container/minimum of 1,800 gallons of discharged liquid.	1994 regs/, p. 6
IL	Volume of largest tank + precipitation of 6" rain.	Dept. Ag. p. 13
IN	Combined total of at least 750 gallons.	1992 regs. p. 11
IA	Volume of largest tank parked (average 1,000 gal.). Overriding factors: transfers attended by person who is responsible and liable for spills if pad smaller than required.	Telcon Chick Eckermann 515 281 8590
KS	110% of largest container.	Telcon Greg Krissek 913 296 2263
LA	Only states that immediate notification must be made of spill.	1984 Dept. Ag. p. 46
MI	Minimum 10' wide, 2' long; adequate catch basins designed to contain minimum of 1500 gallon discharge. Unless container or mobile container less than 1000 gallons, then basin adequate to hold 110% of whichever is larger (container or mobile container).	1992 MDA p. 6
MN	Minimum of 1,000 gallons.	1989 Dept. Ag. p. 10
MO	Contain spills for amount of time needed for cleanup and recovery.	1992 Dept. Nat. Rscs. p. 84
NE	Minimum of 1,800 gallons or 1.5 times largest container, whichever is smaller.	1992 regs. Dept. Env. Qual. p. 13
NH	1,000 gal. or 100% of largest tank if none exceeds 1,000 gallons.	Rules/regs. p. 13
ND	No specifics.	Telcon Barry Coleman 701 328 4756
OH	Applicator responsible for containing spills to pad.	Telcon Jim Belt 614 728 6987
SD	Sufficient capacity & area to contain discharge from largest container/application system operated within and prevent spillage into unprotected area. Minimum capacity 250 gals.	1992 Pesticide Rules p. 44

State	Standard	Comment Source
VT	125% of largest mobile container.	1991 Dept. Ag. p. 64
WA	125% of largest container/equipment up to a maximum of 1,500 gallons.	1997 rules DA p. 12-13
WV	Minimum of 250 gallons, and must provide 125% of largest container or vehicle operated in area.	Title 61 rules p. 3
WI	Large enough to contain spillage from all portions of vehicle involved in loading. Minimum size 10' by 10' with curb, 15" by 15" if only slope is used w/o curb.	Administrative Code p. 8

Appendix D: Overview of Current Federal and State Regulations

The storage of pesticides in bulk quantities is regulated by an interrelated combination of federal regulations, state regulations, market forces, and public pressures. The development of specific containment regulations will alter the regulatory baseline and will correct deficiencies within the current regulatory scheme, as summarized below.

D.1 Federal Regulations

Secondary containment for bulk pesticide storage containers and containment pads to be used in conjunction with pesticide dispensing activities are not directly regulated by federal statutes. However, federal regulations or laws do indirectly provide significant incentives to properly manage pesticide storage, including construction of containment structures.

The federal law providing the greatest incentive to install such structures is the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and its subsequent amendments. CERCLA's liability requirements make operators; owners; and, in some cases, lenders liable for cleanup costs and environmental damages due to pollution. Owners and operators reduce their liability through safer operating procedures that reduce the potential for release into the environment.

Moreover, lenders are highly sensitive to CERCLA liability exposure and will not make loans on collateral that they perceive may become contaminated and then go into default, leaving the lender responsible for the cleanup. Thus, to obtain loans, pesticide dealers must exhibit improved environmental risk management. The significance of this is exemplified through recent actions by the American Bankers Association's Agricultural Bankers Division to develop a handbook to provide guidance to bankers on exercising environmental "due diligence" and assessing environmental risk. The ABA handbook, *Agricultural Lenders Guide to Environmental Liability* (1990), sends a strong message to agribusiness to minimize bankers' and their own exposure to environmental risks/damages if they wish to continue to have access to debt financing.

At the time of the proposed rule, the existing regulations regarding procedures for storage and disposal of pesticides and pesticide containers were listed under Part 165 of Title 40 of the *Code of Federal Regulations* (40 CFR Part 165). In March 1995, as part of President Clinton's initiative to streamline regulations, Part 165 was deleted as unnecessary (60 FR 32094). Subpart A contained scope and definitions. Subpart B dealt with EPA's disposal of suspended and canceled pesticides, and EPA has completed disposal of all pesticides for which it was responsible under these regulations. Subparts C and D contained recommended procedures for storage and disposal of pesticide containers. These subparts were superseded by the passage of the Resource Conservation and Recovery Act in 1976. FIFRA Section 19, as revised in 1988 and 1996, contains authority for EPA in the area of pesticide storage and disposal, and the final pesticide container and containment regulations promulgated are being inserted into a newly established Part 165.

Part 165 of the *Code of Federal Regulations* contained recommended procedures and criteria for the storage of pesticides and pesticide containers (40 CFR §165.10). Secondary containment was addressed as follows for storage sites (§165.10(b)):

> "...Where warranted, drainage from the site should be contained (by natural or artificial barriers or dikes), monitored..."

This was only a recommendation, rather than a requirement, and, by itself, probably had limited effect on the use of secondary containment in bulk storage areas.

Other federal regulations that influence pesticide storage activities include the Occupational Safety and Health Act (OSHA), the Effluent Limitations Guidelines and Standards under the Clean Water Act, the Environmental Planning and Community Right-to-Know Act (EPCRA), and the Resource Conservation and Recovery Act (RCRA). OSHA, in general, outlines safety standards and guidance for worker safety at pesticide storage facilities. The effluent guidelines establish limitations on the pollutants discharged into U.S. waters from industrial point sources, including pesticide formulating, packaging, and repackaging (refilling) establishments. EPCRA was enacted as part of the Superfund Amendments and Reauthorization Act of 1986 (SARA). Its purpose is to alert communities about dangerous chemicals present in their area and to plan for emergency releases before they happen. In the case of pesticides, this could cause some dealers to install secondary containment, although such action is not specifically required. This law was prompted by such disastrous pesticide release incidents as in Institute, West Virginia, and Bhopal, India. RCRA has a lesser influence on storage except that contaminated soil resulting from a pesticide storage tank release or other pesticide spill could be a RCRA waste (40 CFR §261.33(d)). Secondary containment and/or containment pads would reduce the quantity of waste generated from cleanup of a release.

The overall effect of these federal regulations cannot be documented. However, they do represent a set of factors that encourage installation of some containment structures for pesticide bulk storage and for dispensing activities.

D.2 State Regulations

By October 1998, 19 states had promulgated containment regulations for bulk pesticide storage. These states are Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, North Dakota, Ohio, South Dakota, Vermont, Washington, West Virginia, and Wisconsin. In addition to the states with existing regulations, Massachusetts and North Carolina have draft regulations pending. A summary of regulations in these states is provided in Appendix C, based on a comprehensive review conducted by EPA's Office of Pesticide Programs in January 1998.

For purposes of this analysis, it is assumed that affected facilities in the 19 regulated states will not incur additional costs as a result of federal regulations, unless it is evident that the states' regulations do not address a general federal requirement. Rather, it is assumed that the affected facilities have incurred or will soon incur costs as a result of state regulations. Facility-level costs are calculated for the two states with pending regulations since facilities in these states are

expected to incur costs as a result of the federal regulations prior to enactment of state regulations.

A review of the regulations promulgated by several states indicates that there are differences between states regarding the volume of pesticides in one container that triggers "bulk" storage criteria, differences in the site activity that triggers compliance, differences in secondary containment requirements (for example, differences in the capacity required for secondary containment structures), differences in operational containment pad requirements, and differences in the entities to be regulated. Adjusted against the number of facilities with bulk pesticide storage in each state based on commercial, state, and government business census data, facilities in the 19 states with containment regulations (4,220 facilities) represent approximately 84 percent of total number of bulk dealers (5,040) in the United States.

Table D.1. State Regulations of Bulk Pesticide Storage

State	Secondary Containment Required	Operational Containment Pad(S) Required	Last Revision
Colorado	Yes	Yes	1992
Illinois	Yes	Yes	1991
Indiana	Yes	Yes	1993
Iowa	Yes	Yes	1991
Kansas	Yes	No [b]	1985
Kentucky	Yes	Yes	1998
Louisiana	Yes	No [b]	1984
Michigan	Yes	Yes	1993
Minnesota	Yes	Yes	1989
Missouri	Yes	Yes	1992
Nebraska	Yes	Yes	1992
New Hampshire	Yes	Yes	1985
North Dakota	Yes	No [b]	1992
Ohio	Yes	Yes	1991
South Dakota	Yes	Yes	1992
Vermont	Yes	Yes	1992
Washington	Yes	Yes	1994
West Virginia	Yes	Yes	1993
Wisconsin	Yes	Yes	1989
Massachusetts [a]	Yes	Yes	TBD
North Carolina [a]	Yes	Yes	TBD

Source: Regulatory Review conducted by EPA's Office of Pesticide Programs, Pesticide Management, and Disposal Staff (January 1998) from personal communications with various state agency personnel; review of state regulations.
[a] Regulations pending.
[b] Regulations do not specify operational pad, but do require secondary containment for storage/handling of bulk pesticide, defined as any container greater than 55 gallons.

Some state regulations, however, do not adequately address all federal requirements. For example, Louisiana and North Dakota have promulgated containment regulations that do not strictly meet EPA's containment pad requirements. Louisiana's containment regulations apply to handling facilities as well as storage facilities. However, the regulations specify only immediate notification of spills, and not construction requirements. Requirements in North Dakota do not specifically mention containment pads, although the regulations specify that "bulk storage containers and loading areas must be constructed and located on a site in a manner so that pesticides will not contaminate streams and water supplies." Therefore, costs are calculated to construct pads that meet federal requirements in these states.

In addition, nine states have regulations that may not be consistent with EPA's recommended containment material: three states (Minnesota, Vermont, and Wisconsin) specifically allow earth or asphalt secondary containment with liners. Six other states (Kansas, Louisiana, Missouri, North Dakota, Ohio, West Virginia) do not specify construction material but give general performance standards that could be met by lined earth or asphalt.

Pesticide containment regulations in Minnesota, Vermont, and Wisconsin are virtually identical, specifying that when earth or asphalt are used, both the walls and base of the containment must be lined with reinforced concrete, a synthetic liner, inorganic soil, ferrous metal, or stainless steel.[73] No facilities have been identified in these three states that store pesticides with lined earth or asphalt secondary containment; however, such containment structures are used for fertilizer storage. No problems of leakage or spills have been noted from the fertilizer storage, and state representatives have stated a policy that future pesticide storage facilities would not be approved for use with lined earth or asphalt. Facilities in Vermont currently store only fertilizer in such containment structures. Representatives would not necessarily rule out approval of a future pesticide bulk storage facility; however, they would evaluate approval of such a facility on a case-by-case basis, considering the size, geology, and hydrology of the area.

State regulations in Kansas, Louisiana, Missouri, North Dakota, Ohio, and West Virginia were also reviewed. These states have containment regulations that do not specify containment material but define the characteristics of secondary containment walls in such a way that they could be satisfied by lined earth or asphalt. None of these six states have existing pesticide storage facilities that use earth or asphalt containment, but most have a few fertilizer storage facilities with lined earth containment. Ohio estimates that less than 5 percent of fertilizer facilities use earthen containment, but they are inspected and must ensure permeability less than 1×10^{-5} cm/sec. It is possible that Ohio officials would approve future pesticide storage containment constructed of earth if it could be proven to be impervious. Missouri does not allow asphalt, and estimates that 5 percent of its fertilizer facilities are contained within earthen walls. Such facilities protect large outdoor tanks (up to 1 million gallons) and are required to have a containment capacity of 125 percent of the volume of the largest tank within the containment.

[73] Requirements in these states include: (1) containment walls that withstand a full hydrostatic head of any released liquid; (2) walls must be lined and protected from erosion, and must have a horizontal to vertical slope of at least 3 to 1, unless a steeper slope is consistent with good engineering practice; (3) walls may not exceed 6 feet in height above the interior grade; and (4) liners may be concrete, synthetic (minimum thickness 0.8 mm, chemically compatible, photo-resistant and puncture-resistant, with 12 inches of soil above and 6 inches below), or soil. Soil liners may be inorganic soil treated with bentonite clay. Specifications are given in the regulation for thickness, permeability, plasticity, and soil particle size.

Louisiana, North Dakota, and Kansas stated that lined earth or asphalt would not be approved for pesticide containment structures. West Virginia would strongly discourage such a construction if it were proposed.

D.3 Business and Market Considerations

The combination of federal and state regulations, insurance considerations, public relations, consumer demands, and business risks creates a business or market climate that encourages better stewardship of the distribution and use of pesticides. One result of this is the increased adoption of such practices as secondary containment.

Many of the major registrants of pesticides (including Monsanto and BASF) require secondary containment for bulk storage containers at facilities that purchase their products in bulk. One major registrant, Syngenta, provides price incentives and various types of insurance for its products if dealers have approved bulk storage and rinsate pad containment. Some companies and associations have developed bulk storage guidelines for bulk pesticide handlers. Thus, many facilities in unregulated states will be in compliance with the proposed regulations because of manufacturers' requirements. In addition, insurance companies provide dealers with loss control surveys that suggest improved pesticide bulk storage practices (Tatman, 1991). While these business and market forces are real, the extent of their influence is uncertain.

Appendix E: EPA's Proposed Pesticide Containment Standards

This Appendix describes the requirements to construct new and to retrofit existing containment structures and pads, as proposed in the 1994 *Federal Register* Notice of the Proposed Rule (EPA, 1994) Separate categories of the proposed requirements included: (1) general requirements for containment structures; (2) secondary containment for stationary liquid bulk containers; (3) secondary containment for stationary dry bulk containers; (4) containment for pesticide dispensing areas; and (5) recordkeeping requirements. Several of these requirements have been modified or eliminated from the final rule requirements following the public comment period and subsequent deliberations by the Agency.

Compliance with federal standards was initially proposed within 2 years after publication of the final rule for new structures and within 10 years for existing structures. An 8 year phase-in period was provided for existing containment structures, during which time "interim" standards would apply rather than the "full" standards. The phase-in period was to begin 24 months after publication of the final rule in the *Federal Register.* Full standards for existing facilities, which included structural features that might not be readily incorporated without major modification, were to be required 10 years after the publication of the final rule. This compliance period represented one-half to two-thirds of the 15- to 20-year service life of an average well-built and well-maintained containment structure.

E.1 General Requirements for Containment Structures

Certain general requirements affecting both secondary containment structures and containment pads did not differ between the interim and full standards under the proposed rule. These included: (1) materials of construction; (2) stormwater controls; (3) protection of appurtenances and containers; (4) anchoring of liquid bulk tanks; (5) handling of collected pesticide, spills, and rinsates; (6) presence of an attendant during transfer of pesticides; (7) inspection and maintenance; and (8) sealing of cracks and gaps.

General requirements applicable after the interim period under the proposed full standards included:

- **Hydraulic Conductivity:** To prevent pesticides from penetrating into the concrete or other material of construction, a hydraulic conductivity standard of $<1 \times 10^{-6}$ centimeters per second (cm/sec) had to be met during the interim period, and a standard of $<1 \times 10^{-7}$ cm/sec applied after the interim period would have expired. Since even minor fractures or cracks would reduce the hydraulic conductivity of concrete below the proposed standard, surface sealants or coatings, liners beneath the structure, or some combination thereof had to be used to meet the full standard.
- **Appurtenances:** No appurtenances, discharge outlets, or gravity drains through the base or wall of the containment structure were allowed under the full standards, and appurtenances were to be configured so that leakage can be readily observed (not applicable during the interim period).

E.2 Secondary Containment for Stationary Liquid Bulk Containers

The full standards for new liquid bulk containment structures in the 1994 proposed rule specified that secondary containment structures not protected from precipitation should have a capacity of at least 125 percent of the capacity of the largest stationary bulk container within the containment unit, plus the volume displaced by other containers and appurtenances. If the structure were protected from precipitation (e.g., an indoor storage facility or an outdoor storage area with a roof), capacity would have had to be at least 110 percent of the capacity of the largest bulk container plus the volume displaced by other containers and appurtenances.

For existing structures, the proposed capacity requirements for secondary containment structures were set lower under the interim standards than under the full standards. Under the interim standards, a secondary containment area protected from precipitation would have been required to have a minimum capacity equal to 100 percent of the capacity of the largest stationary bulk container within the area plus the displaced volume. If the container was not protected from precipitation, the proposed rule specified a minimum capacity equal to 110 percent of the capacity of the largest stationary container within the area plus the displaced volume of other containers and appurtenances. This was subsequently referred to as the 100/110 standard for interim period facilities. Following expiration of the interim period, the proposed full standard would have been more stringent at 110/125 (i.e., the capacity requirement for the largest container within a secondary containment area was proposed at 110 percent for a protected area and 125 percent for an unprotected area).

Under the full standards, the rule proposed that the secondary containment area allow for the observation of leakage from the base of any enclosed stationary bulk container. Two types of containers are commonly used by pesticide refilling and dispensing facilities: cone-shaped and flat bottomed containers. Leakage from cone-shaped containers is easily observed. Flat-bottomed containers, on the other hand, rest flush with the floor of the containment area, and would have required a method for leak detection to meet the full standards. To comply with the proposed rule, flat-bottomed containers would have needed to be elevated through the use of legs, skids, raised beds of gravel, or other methods to meet the full standards. During the interim period, any tanks not easily observed for leakage were to be inventoried and reconciled each month. All stationary bulk containers were to be anchored to prevent flotation, should the containment area become completely filled with liquid. This requirement applied under both the interim and full standards.

E.3 Secondary Containment for Stationary Dry Bulk Containers

The proposed full standards for new dry bulk containment structures required capacity of at least 100 percent of the volume of the largest stationary dry bulk container within the containment, plus the volume displaced by other containers and appurtenances. No minimum capacity requirements were proposed for existing secondary containment structures for stationary dry bulk containers during the interim period.

E.4 Secondary Containment for Pesticide Dispensing Areas

For existing and new pesticide dispensing areas, the proposed standards required that containment pads have a minimum holding capacity of 1,000 gallons, or, if no equipment used

on the pad exceeded 1,000 gallons, at least 100 percent of the capacity of the largest equipment used on the pad. All existing and new pads also had to have a means of removing and recovering spilled, leaked, or discharged material and rainfall.

The proposed rule required that, after the interim period, all pads had to slope toward a liquid-tight sump, maintaining the requirement for removal and recovery. Manually activated pumps were allowed, but pumps lacking automatic overflow cutoff switches were prohibited.

The rule proposed three conditions under which a pesticide dispensing area would be exempt from the containment pad requirements: (1) if the only pesticides handled in the dispensing area are pesticides that would be gaseous if released at 20°C and at sea level; (2) if the only pesticide containers refilled within the pesticide dispensing area are stationary bulk containers protected by a secondary containment structure meeting the standards; or (3) if the pesticide dispensing area is used solely for dispensing pesticides from a railcar that is not a stationary bulk container.

E.5 Recordkeeping Requirements

Recordkeeping requirements under both the proposed interim and full standards would have required that records be kept of each inspection and all maintenance for each containment structure and stationary bulk container and its appurtenances. Also required under both the interim and full standards were records of the duration for which a pesticide remained in the same location in any bulk container not protected by a secondary containment area. Written confirmation of hydraulic conductivity and pesticide-resistance statements were required under both the interim period and full standards, covering the entire period during which the referenced product was used at a facility. Records of inventory and reconciliation, kept only during the interim period for tanks not readily observable for leakage, were also required under the proposed rule.

E.6 Stationary Containers Included

In the proposed rule, stationary bulk containers designed to hold undivided quantities of agricultural pesticides greater than 793 gallons of liquid pesticides or greater than 4,409 pounds of dry pesticides were subject to the containment regulations. The rule did not require containers with capacity less than these volume/weight thresholds to be protected with a secondary containment unit. A stationary bulk container includes any bulk container, including transport vehicles that are fixed or remain at a facility for at least 30 consecutive days.

Table E.1. Containment Proposed Rule Options Costs (2005$)

Regulation	Option 1	Option 2	Option 3
Costs			
General Requirements for Containment Structures [a]	Regulatory Option 1 is no change in the containment requirements, with no additional cost.	361,223	365,442
Secondary Containment for Stationary Liquid Bulk Containers		6,247,546	18,823,259
Secondary Containment for Stationary Dry Bulk Containers		679,907	1,332,786
Secondary Containment for Pesticide Dispensing Areas [b]		5,668,247	14,049,479
Recordkeeping Requirements		Incorporated in containment cost estimates.	
Total Costs	**0**	**12,956,923**	**34,570,965**
Benefits	**$9.3 million-$ 15.6 million**		

[a] This is the cost under the proposed rule of complying pesticide container requirements, including having containers anchored or elevated to prevent floatation in the event that the secondary containment unit fills to capacity with liquid. If not elevated, all containers would be required to be inventoried and reconciled monthly to detect leakage. The General Requirements for Containment Structures in the proposed rule also includes many other provisions, such as standards for secondary containment construction.

[b] For facilities that would be required to install both new bulk storage secondary containment and new containment pads for dispensing areas, the Regulatory Impact Analysis for the proposed rule reported the costs of both together. The combined costs are included here under Secondary Containment for Bulk Storage Containers.

Appendix F: Comparison of the Proposed and Final Containment Regulations

Table F.1 presents a comparison of the proposed and final pesticide bulk containment regulations. Compared to the proposed standards, the most significant changes under the final rule are as follows:

- The final rule deletes hydraulic conductivity standards and associated recordkeeping and inventory reconciliation.
- The final rule deletes the interim standards, and establishes a set of standards for existing structures and more stringent full standards for new structures.
- The final rule adjusts capacity standards for new and existing structures.
- The final rule reduces recordkeeping responsibilities.

Table F.1. Comparison of Proposed and Final Standards for New Containment Structures

Criteria	Proposed	Final
Facilities §165.141	Facilities including refilling establishments, custom blenders, and applicators for compensation.	Same.
Bulk Containers §165.142a	All stationary bulk containers in affected facilities must have secondary containment except emptied tanks, rinsate and wash water tanks, gas pesticide tanks, and non-pesticide use tanks.	Same.
Pesticide Dispensing Areas §165.142b	Pesticide dispensing areas include: (1) dispensing or refilling pesticides from a stationary bulk container for any purpose; (2) dispensing from a non-stationary bulk container for refilling; (3) emptying, cleaning, or rinsing refillables; (4) filling a stationary bulk container from a transport vehicle.	Same, except for: (4) filling a *refillable* container from a transport vehicle.
Define New §165.144	Begin installation at least 3 months after final rule is published.	Same.
Material §165.146a	Reinforced concrete or other rigid material to withstand full hydrostatic head. Asphalt and earthen material prohibited.	Same.
Hydraulic Conductivity §165.146a3	Interim period standards: 1×10^{-6} cm/sec. Permanent standards: 1×10^{-7} cm/sec.	Delete all references to specific hydraulic conductivity standard.
Sealants §165.146a3	Sealants can be used to achieve hydraulic conductivity standard.	Delete tests and five-year replacement costs from cost analysis. Facility may voluntarily choose sealants to achieve liquid-tightness.
Material §165,146a(4)	Pesticide resistant.	Pesticide compatible.
Design - Stormwater §165.146b(1)	Prevents water from seeping or flowing onto it from adjacent land structures during a 25-year, 24-hour rain event.	Has sufficient freeboard to prevent water from seeping or flowing onto it from adjacent land.
Appurtenances §165.146b(2) & (3)	Appurtenances protected, no outlets or drains at base. Configured so leaks can be observed.	Same.
Operation §165.146c(1)-(4)	Prevents escape of pesticide; all transfers attended; lockable valves; cleanup no later than end of day of spill.	Same.

Table F.1. Comparison of Proposed and Final Standards for New Containment Structures (Continued)

Criteria	Proposed	Final
Inspection §165.146d(1)	Monthly when pesticides are stored or dispensed.	Same.
Maintenance §165.146d(2)-(3)	Repair cracks or gaps, removal of pesticide. No storage until repaired.	Same, except deletion of reference to hydraulic conductivity standard.
Liquid Capacity §165.148a	Interim: 110 percent / 100 percent (outdoor/indoor) Permanent: 125 percent / 110 percent (outdoor/indoor)	Delete reference to interim period. Retain 110 percent / 100 percent for permanent standard.
Design - Elevation & Anchoring §165.148b	Assured by elevation of bulk container on legs, gravel, etc. Anchored to prevent flotation.	Delete reference to interim period. Delete requirement for elevated tanks. Retain requirement to anchor tanks to prevent flotation.
Inventory Reconciliation §165.148c	Monthly during interim period.	Delete.
Dry Bulk Capacity §165.150a - B	100 percent of largest container plus displaced volume.	Protected from wind/rain, on pallets or concrete platform to prevent water in or under the pesticide. Enclosed by 6-inch high curb that extends at least 2 feet beyond the perimeter of container.
Pad Capacity §165.152a	1,000 gallons or 100 percent of largest container.	750 gal or 100 percent of largest container.
Pad Design §165.152b	Intercept spills, base sloped toward liquid-tight sump; means of removing discharged material or rainfall. Surface extends completely beneath any container on pad except transport vehicles, for which pad must accommodate coupling devices.	Same.
Integrated Systems §165.153	Pads and secondary containment units may be combined.	Same.
Segregation §165.153	Multiple pesticides can be stored in same containment.	Same.
Compliance Date §165.156	2 year (interim) / 8 year (permanent)	Delete reference to interim period. Three years for existing structures to meet critical standards; 3 years for new structures to meet full standards.
Recordkeeping and Inspection §165.157	Monthly inspection. Maintain records for 3 years: inventory reconciliation during interim period; non-stationary bulk tanks duration at facility; hydraulic conductivity.	Delete recordkeeping for inventory reconciliation and hydraulic conductivity. Retain monthly inspection and 3-year recordkeeping for inspection and non-stationary bulk tanks.

Appendix G. Estimated Number of Affected Facilities

Table G.1. Estimated Number of Agricultural Pesticide Refillers by State, 1992 *

State	State Reg. (Y/N)	1992 American Business Information's Lists of 9.3 Million Businesses [a]						1992 Census of Wholesale Trade		# of Dealers Estimated by State Experts	Total Agricultural Pesticide Refillers (Adjusted) [c]
		Farm Supply Dealers (SIC 5191.02)		Fertilizer Dealers (SIC 5191.14)		Agchem Dealers (SIC 5191.02 + 5191.14)		Farm Supply (SIC 5191) [b]			
		# Estab.	% Total	# Estab.	% Total	# Estab.	% Total	# Estab.	% Total		
Alabama	N	215	3.69%	178	1.71%	393	2.42%	303	1.73%		393
Alaska	N	1	0.02%	1	0.01%	2	0.01%	9	0.05%		2
Arizona	N	24	0.41%	72	0.69%	96	0.59%	181	1.04%		96
Arkansas	N	148	2.54%	148	1.42%	296	1.82%	349	2.00%	350 [d]	350
California	N	32	0.55%	283	2.72%	315	1.94%	1129	6.46%		315
Colorado	Y	58	1.00%	183	1.76%	241	1.48%	200	1.14%		241
Connecticut	N	6	0.10%	47	0.45%	53	0.33%	57	0.33%		53
Delaware	N	7	0.12%	22	0.21%	29	0.18%	37	0.21%		29
DC	N	0	0.00%	0	0.00%	0	0.00%	1	0.01%		0
Florida	N	164	2.81%	339	3.26%	503	3.10%	665	3.81%		503
Georgia	N	240	4.12%	287	2.76%	527	3.25%	510	2.92%		527
Hawaii	N	0	0.00%	26	0.25%	26	0.16%	50	0.29%		26
Idaho	N	57	0.98%	147	1.41%	204	1.26%	203	1.16%		204
Illinois	Y	347	5.96%	909	8.73%	1,256	7.74%	1033	5.91%		1,256
Indiana	Y	188	3.23%	547	5.26%	735	4.53%	627	3.59%	500 [e]	500
Iowa	Y	291	4.99%	575	5.53%	866	5.33%	953	5.46%		866
Kansas	Y	158	2.71%	450	4.32%	608	3.75%	304	1.74%	1,799 [f]	608
Kentucky	Y	300	5.15%	195	1.87%	495	3.05%	421	2.41%		495
Louisiana	Y	148	2.54%	139	1.34%	287	1.77%	284	1.63%		287
Maine	N	20	0.34%	21	0.20%	41	0.25%	47	0.27%		41
Maryland	N	53	0.91%	107	1.03%	160	0.99%	141	0.81%		160
Massachusetts	P	13	0.22%	50	0.48%	63	0.39%	108	0.62%		63
Michigan	Y	158	2.71%	253	2.43%	411	2.53%	365	2.09%		411

Table G.1. Estimated Number of Agricultural Pesticide Refillers by State, 1992 (Continued)

State	State Reg. (Y/N)	1992 American Business Information's Lists of 9.3 Million Businesses [a]						1992 Census of Wholesale Trade		# of Dealers Estimated by State Experts	Total Agricultural Pesticide Refillers (Adjusted) [c]
		Farm Supply Dealers (SIC 5191.02)		Fertilizer Dealers (SIC 5191.14)		Agchem Dealers (SIC 5191.02 + 5191.14)		Farm Supply (SIC 5191) [b]			
		# Estab.	% Total	# Estab.	% Total	# Estab.	% Total	# Estab.	% Total		
Minnesota	Y	177	3.04%	500	4.80%	677	4.17%	674	3.86%	1,335 [g]	677
Mississippi	N	201	3.45%	167	1.60%	368	2.27%	257	1.47%	438 [h]	438
Missouri	Y	250	4.29%	563	5.41%	813	5.01%	707	4.05%		813
Montana	N	62	1.06%	91	0.87%	153	0.94%	146	0.84%	580 [i]	153
Nebraska	Y	155	2.66%	339	3.26%	494	3.04%	529	3.03%	700 [j]	700
Nevada	N	9	0.15%	10	0.10%	19	0.12%	45	0.26%		19
New Hampshire	Y	6	0.10%	15	0.14%	21	0.13%	23	0.13%		21
New Jersey	N	19	0.33%	59	0.57%	78	0.48%	220	1.26%		78
New Mexico	N	20	0.34%	49	0.47%	69	0.43%	88	0.50%		69
New York	N	124	2.13%	147	1.41%	271	1.67%	642	3.68%		271
North Carolina	P	265	4.55%	412	3.96%	677	4.17%	553	3.17%	996 [k]	677
North Dakota	Y	69	1.18%	252	2.42%	321	1.98%	161	0.92%		321
Ohio	Y	222	3.81%	382	3.67%	604	3.72%	558	3.19%	660 [l]	660
Oklahoma	N	131	2.25%	232	2.23%	363	2.24%	293	1.68%	370 [m]	370
Oregon	N	52	0.89%	123	1.18%	175	1.08%	269	1.54%		175
Pennsylvania	N	103	1.77%	155	1.49%	258	1.59%	471	2.70%	216 [n]	216
Rhode Island	N	1	0.02%	5	0.05%	6	0.04%	23	0.13%		6
South Carolina	N	126	2.16%	141	1.35%	267	1.64%	214	1.23%		267
South Dakota	Y	56	0.96%	147	1.41%	203	1.25%	204	1.17%	600 [o]	300
Tennessee	N	232	3.98%	194	1.86%	426	2.62%	356	2.04%	225 [p]	225
Texas	N	379	6.50%	652	6.27%	1,031	6.35%	1,339	7.67%	1,500 [q]	1,500
Utah	N	39	0.67%	30	0.29%	69	0.43%	84	0.48%		69
Vermont	Y	23	0.39%	20	0.19%	43	0.26%	51	0.29%		43
Virginia	N	172	2.95%	212	2.04%	384	2.37%	322	1.84%		384
Washington	Y	80	1.37%	205	1.97%	285	1.76%	406	2.32%		285
West Virginia	Y	40	0.69%	20	0.19%	60	0.37%	87	0.50%	140 [r]	140

Table G.1. Estimated Number of Agricultural Pesticide Refillers by State, 1992 (Continued)

State	State Reg. (Y/N)	1992 American Business Information's Lists of 9.3 Million Businesses [a]						1992 Census of Wholesale Trade		# of Dealers Estimated by State Experts	Total Agricultural Pesticide Refillers (Adjusted) [c]
		Farm Supply Dealers (SIC 5191.02)		Fertilizer Dealers (SIC 5191.14)		Agchem Dealers (SIC 5191.02 + 5191.14)		Farm Supply (SIC 5191) [b]			
		# Estab.	% Total	# Estab.	% Total	# Estab.	% Total	# Estab.	% Total		
Wisconsin	Y	169	2.90%	278	2.67%	447	2.75%	715	4.09%		447
Wyoming	N	17	0.29%	28	0.27%	45	0.28%	55	0.31%		45
Totals		**5,827**	**100%**	**10,407**	**100%**	**16,234**	**100%**	**17,469**	**100%**		**16,795**

Totals may not add due to rounding. Y = State regulations as of 2002. P = Pending proposed regulations. State Reg. indicates whether or not the state has state containment regulations. * The estimated number of agricultural pesticide refillers is from the proposed EPA containment rule RIA, which is based on 1992 data. By using these data, EPA assumes that the number of facilities in the industry did not change.

[a] For this analysis based on 1992 data, SIC codes were used instead of NAICS codes for convenience. American Business Information data was identified as the only source of information found that provides separate data for farm supply and fertilizer dealer categories within SIC 5191.

[b] SIC 5191 at the 4-digit level includes all establishments primarily engaged in the wholesale distribution of animal feeds, fertilizers, agricultural chemicals, pesticides, seeds, and other farm supplies, except grains. Thus, many of the establishments listed in SIC 5191 do not handle pesticides.

[c] State estimates where available; otherwise, SIC 5191.02 + SIC 5191.14 from the American Business Information Lists of 9 Million Businesses, 1990.

[d] Flowers, Plant Board, Little Rock, AR; Registered Use Pesticide (RUP) dealers, with a few non-RUP dealers in the state.

[e] Scott, IN State Chemist's Office.

[f] Breedlove, KS Department of Agriculture.

[g] Narikawa, MN Department of Agriculture; includes all pesticide storage facilities, including those handling non-agricultural pesticides in small packages of less than 56 gallons. Estimates by SIC code are believed to more closely represent agricultural pesticide refillers (agchemical dealers).

[h] Fulton, MS Department of Agriculture and Commerce; estimate reflects Registered Use Pesticide dealers.

[i] Gingery, MT Department of Agriculture; includes both agricultural and industrial pesticide dealers. Estimates by SIC code are likely more representative of agricultural pesticide refillers (agchemical dealers).

[j] Heitman, Environmental Control Department, Lincoln, NE; estimate represents fertilizer/agricultural dealers.

[k] Dixon, NC Department of Agriculture; estimate reflects number of licensed commercial pesticide dealers in NC. Since this estimate includes non-ag dealers, estimates by SIC are likely more representative of agricultural pesticide refillers (agchemical dealers).

[l] Beal, OH Department of Agriculture.

[m] Chada, OK Department of Agriculture; Restricted Use Pesticide dealers.

[n] Uram, PA Department of Agriculture; estimate reflects 25% of the 864 licensed pesticide dealers in PA. Remaining 75% represent stores such as K-Mart that sell non-restricted pesticides.

[o] Berven, SD Department of Agriculture; estimate likely includes industrial and other non-ag dealers, so is adjusted downward for state total.

[p] Foster, TN Department of Agriculture; estimate reflects 75% of 300 Restricted Use Pesticide dealers as agricultural; remaining 25% non-ag.

[q] Renchie, Texas Department of Agriculture.

[r] Frank, WV Department of Agriculture; estimate reflects Registered Use Pesticide dealers.

Table G.2. Regulatory Compliance Baseline for Agricultural Pesticide Refillers with Bulk Pesticide Storage ***

State	State Reg (Y/N)	Adjusted # Agchem Dealers [a]	Percent Dealers with Bulk [b]	No. of bulk dealers (>55 gal.) [c]	Total bulk dealers (>500 gal.) [d]	Secondary Containment [e]		Roofed or Indoor Storage		Containment Pads	
						With	Without	With [f]	Without [g]	With [h]	Without [i]
Alabama	N	393	10%	39	35	14	21	11	25	9	26
Alaska	N	2	10%	0	0	0	0	0	0	0	0
Arizona	N	96	10%	10	9	4	5	3	6	2	7
Arkansas	N	350	11% [j]	40	36	14	22	11	25	9	27
California	N	315	25%	79	71	28	43	21	50	18	53
Colorado	Y	241	25%	60	54	54*	0	16	38	54	0
Connecticut	N	53	10%	5	5	2	3	2	4	1	4
Delaware	N	29	10%	3	3	1	2	1	2	1	2
D.C.	N	0	10%	0	0	0	0	0	0	0	0
Florida	N	503	10%	50	45	18	27	14	32	11	34
Georgia	N	527	10%	53	47	19	28	14	33	12	35
Hawaii	N	26	10%	3	2	1	1	1	1	1	2
Idaho	N	204	10%	20	18	7	11	5	13	5	14
Illinois	Y	1,256	100% [k]	1,250	1,125	1,125*	0	338	788	1,125	0
Indiana	Y	500	50% [l]	250	225	225*	0	68	158	225	0
Iowa	Y	866	92% [m]	800	720 [m]	720*	0	216	504	720	0
Kansas**	Y	608	26% [n]	157	141	141*	0	42	99	35	106
Kentucky	Y	495	25%	124	111	111*	0	33	78	112	0
Louisiana**	Y	287	25%	72	65	65*	0	19	45	16	48
Maine	N	41	10%	4	4	2	2	1	3	1	3
Maryland	N	160	10%	16	14	6	8	4	10	4	11
Massachusetts	P	63	10%	6	6	2	3	2	4	2	5
Michigan	Y	411	73% [o]	300	270	270*	0	81	189	270	0
Minnesota	Y	677	75% [p]	505	455	455*	0	136	318	455	0
Mississippi	N	438	5% [q]	23	21	8	13	6	15	5	16
Missouri	Y	813	9% [r]	75	68	68*	0	20	47	68	0

Table G.2. Regulatory Compliance Baseline for Agricultural Pesticide Refillers with Bulk Pesticide Storage (Continued)

State	State Reg (Y/N)	Adjusted # Agchem Dealers [a]	Percent Dealers with Bulk [b]	No. of bulk dealers (>55 gal.) [c]	Total bulk dealers (>500 gal.) [d]	Secondary Containment [e]		Roofed or Indoor Storage		Containment Pads	
						With	Without	With [f]	Without [g]	With [h]	Without [i]
Montana	N	153	34% [s]	53	47	19	28	14	33	12	35
Nebraska	Y	700	50%	350	315	315*	0	95	221	315	0
Nevada	N	19	10%	2	2	1	1	1	1	1	2
New Hampshire	Y	21	10%	2	2	2*	0	1	1	1	0
New Jersey	N	78	10%	8	7	3	4	2	5	2	5
New Mexico	N	69	10%	7	6	2	4	2	4	2	5
New York	N	271	25%	68	61	24	37	18	43	15	46
North Carolina	P	677	10%	68	61	24	37	18	43	15	46
North Dakota**	Y	321	30% [t]	96	86	86*	0	26	60	22	65
Ohio	Y	660	44% [u]	292	263	263*	0	79	184	263	0
Oklahoma	N	370	14% [v]	50	45	18	27	14	32	11	34
Oregon	N	175	10%	18	16	6	10	5	11	4	12
Pennsylvania	N	216	25%	54	49	20	29	15	34	12	37
Rhode Island	N	6	10%	1	1	0	1	0	1	0	1
South Carolina	N	267	10%	27	24	10	14	7	17	6	18
South Dakota	Y	300	40% [w]	120	108	108*	0	65 [w]	43	108	0
Tennessee	N	225	3% [x]	6	5	2	3	2	4	1	4
Texas	N	1,500	10% [y]	150	135	54	81	41	95	34	101
Utah	N	69	10%	7	6	2	4	2	4	2	5
Vermont	Y	43	16% [z]	7	6	6*	0	2	4	6	0
Virginia	N	384	10%	38	35	14	21	11	25	9	26
Washington	Y	285	25%	71	64	64*	0	19	45	64	0
West Virginia	Y	140	2% [aa]	3	3	3*	0	1	2	3	0

Table G.2. Regulatory Compliance Baseline for Agricultural Pesticide Refillers with Bulk Pesticide Storage (Continued)

State	State Reg (Y/N)	Adjusted # Agchem Dealers [a]	Percent Dealers with Bulk [b]	No. of bulk dealers (>55 gal.) [c]	Total bulk dealers (>500 gal.) [d]	Secondary Containment [e]		Roofed or Indoor Storage		Containment Pads	
						With	Without	With [f]	Without [g]	With [h]	Without [i]
Wisconsin	Y	447	35% [ab]	154	139	139*	0	7 [ab]	132	139	0
Wyoming	N	45	10%	5	4	2	2	1	3	1	3
Totals		**16,795**		**5,601**	**5,040**	**4,548**	**491**	**1,510**	**3,530**	**4,206**	**834**
States w/ regs		**9,071**		**4,688**	**4,220**	**4,220**	**0**	**1,264**	**2,956**	**4,001**	**219**
States w/o regs		**7,724**		**913**	**820**	**328**	**491**	**246**	**574**	**205**	**615**

Totals may not add due to rounding. Y = State regulations. P = Pending regulations. * Secondary containment standards required by state regulations. ** State regulations do not specify standards for pads. *** The estimates of compliance and the number of agricultural chemical dealers are based on the proposed EPA containment rule RIA. For the final rule the estimates of compliance were updated based on discussions with State agencies and a review of State agency information.

[a] Adjusted # of dealers from Table G.1.

[b] Regional factors used if state estimate not available; Corn Belt states = 50%, other major ag states = 25%, remaining states = 10%.

[c] The baseline estimate of bulk facilities based primarily on data from states which regulate all undivided quantities greater than 55 gallons as bulk.

[d] Based on the estimate in the proposed EPA containment rule RIA that 90% of all bulk facilities store in undivided quantities greater than 500 gallons.

[e] Assumes 100% of facilities in states regulating bulk storage (>250 gallons) have secondary containment units. In unregulated states, 40% of bulk facilities are assumed to have secondary containment.

[f] State estimates of roofed or indoor facilities range from 5% to 60%; figures in this column are based on the estimates used in the proposed EPA containment rule RIA, with a value of 30% unless footnoted.

[g] Total bulk dealers less number of facilities with roofs.

[h] Assumes 100% of facilities in state with mixing/loading or operational pad regulations meet EPA's containment pad requirements; otherwise, we estimate 25% of facilities currently have pads, based on estimates used in the proposed EPA containment rule RIA.

[i] Total bulk dealers less number of dealers with mixing/loading or containment pads.

[j] Flowers, Plant Board, Little Rock, AR; 40 to 50 bulk "sites" registered by manufacturer; some dealers may have more than one "site."

[k] Illinois Fertilizer and Chemical Association (1991). Registered agrichemical facilities. Adjusted to exclude formulators.

[l] Scott, State Chemist's Office, IN; estimate reflects 50% of pesticide dealers have bulk facilities.

[m] Eckerman, IA Department of Agriculture; 813 regulated facilities; 13 are formulators. All facilities are greater than 250 gallons. Adjusted to exclude formulators.

[n] Kansas Department of Agriculture data base; adjusted to exclude formulators.

[o] Darling, MI Department of Agriculture, midpoint of estimated 200 to 400 bulk facilities.

[p] Narikawa, MN Department of Agriculture; 1990 pesticide storage survey results indicate 180 firms with containers from 56 to 499 gallons; 325 firms with containers greater than 500 gallons.

[q] Fulton, MS Department of Agriculture and Commerce; 20 to 25 dealers with bulk facilities.

[r] Leslie, MO Department of Agriculture; 50% of the estimated 150 bulk facilities handle only minibulks.

[s] Gingery, MT Department of Agriculture; 200 out of 580 agricultural and industrial pesticide dealers have bulk facilities.

[t] Peterson, ND Department of Agriculture; 100 permanent bulk facilities; most are dealers and distributors; less than 5 solely commercial applicators.

[u] Beal, OH Department of Agriculture; about 300 bulk facilities; a few may be non-agricultural. Adjusted to exclude formulators.

[v] Chada, OK Department of Agriculture; about 50 bulk storage facilities.

[w] Berven, SD Department of Agriculture; at least 150 facilities, of which 80% are dealers. 60% of bulk storage facilities are indoors.
[x] Foster, TN Department of Agriculture; one large distribution center for cooperatives; 5 or 6 other bulk facilities.
[y] Renchie, TX Department of Agriculture; 7.5 to 10% of pesticide dealers have bulk facilities.
[z] Rogler, VT Department of Agriculture; 6 or 7 facilities.
[aa] Frank, WV Department of Agriculture; 2 or 3 facilities.
[ab] Morrison, WI Department of Agriculture, Trade and Consumer Protection; 250 facilities, including 10 manufacturers or formulators and 30 wood preservers.

Table G.3. Number of Bulk Pesticide Containment Facilities to Install New Units and Pads*

Item	Number of Affected Facilities				
	Small-Small Facility	Medium-Small Facility	Large-Small Facility	Large Facility	Total
Agricultural Pesticide Refillers [a]					
Outdoor Liquid Bulk Storage: Secondary containment + containment pad Number of affected facilities	270	46	5	3	324 [b]
Containment pad only Number of affected facilities	200	34	4	2	240 [b]
Outdoor Liquid and Dry Bulk Storage: Secondary containment + containment pad Number of affected facilities	n/a	17	6	6	28 [c]
Indoor Liquid Bulk Storage: Secondary containment + containment pad Number of affected facilities	116	20	2	1	139 [b]
Containment pad only Number of affected facilities	86	15	2	1	103 [b]
Outdoor Non-bulk Storage: Small containment pad only Number of affected facilities	561	n/a	n/a	n/a	561 [d]
Independent Aerial Applicators [e]					
Outdoor Liquid Bulk Storage: Secondary containment + large containment pad Number of affected facilities	6	9	1	n/a	16 [f]
Large containment pad only Number of affected facilities	n/a	7	3	n/a	10 [f]
Independent Ground Applicators [e]					
Outdoor Liquid Bulk Storage: Secondary containment + medium containment pad Number of affected facilities	n/a	n/a	5	n/a	5 [f]
Medium containment pad only Number of affected facilities	n/a	n/a	3	n/a	3 [f]

Totals may not add due to rounding. * 2005 estimates based on the proposed EPA containment rule RIA.

[a] Distribution of agricultural pesticide refillers among small, medium and large representative facilities assumes the following percent shares across all facilities: small-small (83.3%); medium-small (14.3%); large-small (1.5%); and large (0.9%) (see Table 3.4). Two exceptions made for "Outdoor Liquid and Dry Bulk Storage" and 'Outdoor Non-Bulk Storage" are described under footnotes b and f, respectively.

[b] The number of agricultural pesticide refillers without secondary containment and pads is estimated at 491 facilities and the number of facilities without containment pads is estimated at 834 facilities (Table 3.2). Excluding the 491 facilities that require secondary containment units and pads, the remaining 343 facilities (834-491) will require containment pads only. Excluding the estimated 28 facilities that handle both liquid and dry pesticides, the distribution of the remaining 463 facilities between those that require outdoor and indoor secondary structures is assumed at 70%-30% split (324 and 139 facilities, respectively). Similarly, the distribution of the estimated 343 facilities that require containment a pad only, also assumes a 70%-30% split between outdoor-indoor structures (240 and 103 facilities, respectively), and further assumes that affected facilities will use existing concrete floor as a base for building a containment pad.

Table G.3. Number of Bulk Pesticide Containment Facilities to Install New Units and Pads (Continued)

[c] An estimated 175 agrichemical facilities handle, dispense or store bulk quantities of dry pesticides. It is assumed that 90% (158 facilities) of dry bulk facilities are located in eight states (IN, IL, IA, MI, MN, ND, OH, SD). Based on a review of containment regulations in these states, weighted against the number of liquid bulk facilities in these states, 140 facilities (89 percent) are in compliance. Among the facilities in the remaining states, it is assumed that 40% (7 facilities) are in compliance, given lack of better information. Therefore, an estimated 147 facilities have existing dry bulk storage structures and an estimated 28 facilities will need to construct new secondary units and pads. Assumes all dry bulk containment facilities are jointly located at facilities that also have liquid bulk storage. Assumed distribution: medium-small (60%); large-small (20%); and large (20%).

[d] An estimated 561 non-bulk facilities that may require pad construction based on the number of facilities with bulk liquid storage less than 500 gallons (5601-5040 facilities). See Table G.2.

[e] Distribution of agricultural commercial applicators among small, medium and large representative facilities is based on the assumption in the container rule EIA and assumes the following percent shares across all facilities: small-small (39%); medium-small (56%); and large-small (5%) (EPA, 2005b). The analysis assumes that no large agricultural commercial applicators exist. Only medium-small and large-small aerial facilities are assumed to be affected by containment pad requirements, with 70% and 30% shares of the affected facilities, respectively. Small-small facilities are not expected to engage in activities that require a pad. It is assumed that only large-small ground applicators are affected by containment pad requirements.

[f] The estimated number of agricultural commercial applicator facilities with bulk facilities is estimated at 160 aerial applicators and 50 ground applicators (see Table 3.2). Based on information for agricultural pesticide refillers, 90% of all facilities are estimated to be in compliance with the secondary containment standards and 83% of all facilities are expected to be in compliance with the containment pad standards. Therefore, an estimated 189 facilities have existing secondary containment, and an estimated 21 facilities (16 aerial applicators and 5 ground applicators) will need to construct new secondary units and pads. An estimated 13 facilities (10 aerial applicators and 3 ground applicators) will need to construct new containment pads only. It is assumed that only medium-small and large-small aerial facilities affected by containment pad requirements; Small-small facilities are not expected to engage in activities that require a pad. It is assumed that only large-small ground applicators are affected by containment pad requirements.

Table G.4. Number of Bulk Pesticide Containment Facilities Affected by EPA's Containment Regulations to Retrofit Existing Containment Structures

Item	Number of Affected Facilities	
	Agricultural Pesticide Refillers [a]	Agricultural Commercial Applicators [b]
Secondary Containment - Bulk Liquid Containers		
Seal floor drain or discharge outlet	333	8
Seal all cracks/gaps/seams	295	0
Monthly inspection/records of inspection and maintenance	1,602	62
Secondary Containment - Bulk Dry Containers		
Repair all cracks/gaps/seams	15	n/a
Monthly inspection/records of inspection and maintenance	70	n/a
Containment Pads		
Seal drain	263	7
Add sump and berm	343	11
Repair all cracks/gaps/seams	185	n/a
Monthly inspection/records of inspection and maintenance	1,445	57

Totals may not add due to rounding. For this analysis, compliance rates have been calculated for bulk pesticide storage facilities based on a review of current containment regulations in 19 states (Appendix C) to identify those states with regulations that are consistent with EPA standards. Compliance in the identified number of states has been weighted against the number of bulk liquid pesticide storage facilities in those states. Where data are not available or where it is not clear whether state requirements are consistent with EPA standards, rates that were established for use in the RIA of the proposed rule are used. These rates were estimated in the proposed EPA containment rule RIA estimates based on a review of state regulations in conjunction with information from industry source data.

[a] **SECONDARY CONTAINMENT, AGRICULTURAL PESTICIDE REFILLERS:**

Number of facilities with existing secondary containment structures for bulk liquid containers	4,548	(100%)
Number of facilities in regulated states	4,220	(93%)
Number of facilities that also have bulk dry containers	28	
Number of facilities in non-regulated states	328	(7%)

STATIONARY BULK LIQUID CONTAINMENT:

Seal floor drain or discharge outlet: An estimated 96 percent of secondary containment structures in regulated states are in compliance with EPA standards. It is assumed that about half that percentage, or 50 percent, are in compliance in non-regulated states. Thus, 333 structures are not in compliance and must retrofit [(4220*0.04)+(328*0.50)] by sealing floor drains or discharge outlets.

Seal all cracks: Assumes that 100 percent of structures in regulated states are in compliance because of state requirements to seal all cracks/gaps/seams, but assumes that 10 percent of structures in non-regulated states are in compliance. An estimated 295 structures (328*0.90) are not in compliance.

Monthly inspection/recordkeeping: Weekly or monthly inspections of containment structures are currently required within 11 of the 19 states with containment regulations. Weighted against the number of liquid bulk facilities in these regulated states, an estimated 67% of all facilities in regulated states are in compliance. About 30% all remaining facilities are in compliance. Overall, the number of facilities that will require monthly inspection under the rule is estimated at 1,602 facilities [(4220*0.325)+(328*0.70)].

STATIONARY DRY BULK CONTAINERS: An estimated 147 facilities have existing structures (see Table 3.2).

Repair cracks: Although all regulated states have a requirement to seal all cracks, and although all facilities with dry bulk storage are assumed to be located in regulated states, it is assumed that 90% of all facilities (15) with existing structures (147*0.10) will be affected by this requirement.

Table G.4. Number of Bulk Pesticide Containment Facilities Affected by EPA's Containment Regulations to Retrofit Existing Containment Structures (Continued)

Monthly inspection/recordkeeping: See footnote under 'Stationary Bulk Liquid Containment: Agricultural pesticide refillers" for analytical method used to derive percentage compliance rates. Overall, the number of facilities that will require monthly inspection under the rule is estimated at 70 facilities.

CONTAINMENT PADS, AGRICULTURAL PESTICIDE REFILLERS:

Estimated number of facilities with existing containment pads	4,206 (100%)
Number of facilities in regulated states	4,001 (95%)
Number of facilities in non-regulated states	205 (5%)

Seal drain: About 96 percent of containment pads in regulated states meet the standard for no drains. It is assumed that about 50 percent meet the standard in non-regulated states. Thus, 263 structures are out of compliance [(4,001*0.04)+(205*0.50)] and must seal existing drains.

Add berm: An estimated 94 percent of containment pads in regulated states have a minimum capacity of 750 gallons or 100% of the largest container on the pad and are in compliance. It is assumed that about 50 percent of existing pads in non-regulated states are in compliance. The estimated number of pads required to retrofit is 343 [(4,001*0.06)+(205*0.50)]. The cost for a portable pump and hose for removing collected liquid materials and/or rainfall are included with the secondary containment costs.

Repair cracks: Assumes 100 percent of structures in regulated states are in compliance because of state requirements to seal all cracks/gaps/seams, but assumes only 10 percent of structures in non-regulated states are in compliance. An estimated 185 structures (205*0.90) are not in compliance.

Monthly inspection/recordkeeping: See footnote under "Stationary Bulk Liquid Containment: Agricultural pesticide refillers" for analytical method used to derive percentage compliance rates. Overall, the number of facilities that will require monthly inspection under the rule is estimated at 1,445 facilities [(4001*0.325)+(205*0.70)].

[b] **SECONDARY CONTAINMENT, AGRICULTURAL COMMERCIAL APPLICATORS**:

Number of facilities with existing secondary containment structures for bulk liquid containers	189
Number of facilities in regulated states	189 (100%)
Independent (for-hire) aerial applicators	144 (76% of 189)
Independent (for-hire) ground applicators	45 (24% of 189)

STATIONARY BULK LIQUID CONTAINMENT:

Seal floor drain or discharge outlet: An estimated 96 percent of secondary containment structures in regulated states are in compliance with these facilities. Thus, 8 structures are not in compliance and must retrofit (189*0.04). It is assumed that these 8 must retrofit by sealing floor drains or discharge outlets.

Seal all cracks: Because all regulated states have a requirement to seal all cracks, and because all independent applicator structures are assumed to be located in regulated states, no structure is affected by this requirement.

Monthly inspection/recordkeeping: Weekly or monthly inspections of containment structures are currently required within 11 of the 19 states with containment regulations. Weighted against the number of liquid bulk facilities in these regulated states, an estimated 67% of all facilities in regulated states are in compliance. The number of facilities that will require monthly inspection under the rule is estimated at 62 facilities (189*0.33).

CONTAINMENT PADS, AGRICULTURAL COMMERCIAL APPLICATORS:

Estimated number of facilities with existing containment pads	175
Number of facilities in regulated states	175 (100%)
Independent (for-hire) aerial applicators	134 (77% of 177)
Independent (for-hire) ground applicators	42 (23% of 177)

Seal drain: About 96 percent of containment pads in regulated states meet the standard for no drains. Because all independent applicator containment pads are assumed to be located in regulated states, only 7 (175*0.04) are estimated as out of compliance with this requirement.

Add berm: The estimated level of compliance with the requirement to have a minimum capacity of 750 gallon, achieved by a sump or a berm, is 94 percent. Thus, 11 structures (175*0.06) are estimated as out of compliance.

Repair new cracks: Because all applicators are assumed to be located in regulated states, all are expected to be in compliance.

Monthly inspection/recordkeeping: See footnote under 'Stationary Bulk Liquid Containment: Independent Applicators' for analytical method used to derive percentage compliance rates. The number of facilities that will require monthly inspection under the rule is estimated at 57 facilities (175*0.33).

Appendix H. Representative Facility Costs of Compliance with Secondary Containment Regulations

Table H.1. Capital Costs of Compliance with Secondary Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Secondary Containment of Outdoor Bulk Liquid Pesticides, 2005$ [a]

Capital Cost	$/Unit	$/Facility		
		Small-Small Representative Facility	Medium-Small Representative Facility	Large-Small and Large Represent. Facility
OUTDOOR SECONDARY CONTAINMENT, BULK LIQUIDS				
Concrete pad	5.48/sq ft	1,096	2,739	6,163
Berm [b]	13.74-21.97/ft	850	850	1,096
Portable pump and hose	548/each	548	548	548
Rinsate/precp. storage tank [c]	589-2356/each	589	1,653	2,356
Sump	959-3013/each	959	1,644	3,013
Roof	4.79/sq ft	0	0	0
Pipes and fixtures	2% of direct costs	81	149	264
Contractor's fees	30% of direct costs	1,212	2,230	3,953
Contingency	5% of direct costs+fees	263	483	856
TOTAL, Year 3 [d]		**5,600**	**10,300**	**18,250**

[a] Costs inflated from 1992 to 2005 using the CPI-U "All Items" based adjustment factor of 1.37 (U.S. Department of Labor, 2005).

[b] The cost of the berm for all sizes of facilities will range from $13.74 to $21.97 per foot, depending on the wall height. The higher the wall, the higher the unit cost.

[c] Unit costs for an outdoor rinsate/precipitation storage tank are estimated at $589 (small), $1,653 (medium) to $2,356 (large).

[d] All totals have been rounded to the nearest $10. It is assumed that secondary containment structures are completed by the end of year 3, with the facility in compliance at the beginning of year 4. Capital costs are expected to occur at the end of year 3.

Table H.2. Operating and Management (Annual) and Intermittent Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Secondary Containment of Outdoor Bulk Liquid Pesticides, 2005$ [a]

O&M or Intermittent Cost	$/Unit	$/Facility		
		Small-Small Representative Facility	Medium-Small Representative Facility	Large-Small and Large Represent. Facility
OUTDOOR SECONDARY CONTAINMENT, BULK LIQUIDS				
Operating and management (O&M) costs				
Spill cleanup	28/hr	668	950	1,361
Rinsate/precipitation pumping	28/hr	39	116	218
Rinsate/precipitation off-site [b]	62-151/trip	372	373	1,056
Monthly inspection/ recordkeeping [c]	28/hr	77	103	128
Total O&M, Years 4-20 [d]		**1,160**	**1,540**	**2,760**
Intermittent (every 5 years) costs				
Repair cracks/gaps/seams	2.84/ft	41	96	109
Contractor's fees + contingency	20% intermittent costs	8	19	22
Total intermittent, Years 8,13, and 18 [d]		**50**	**120**	**130**

[a] Costs inflated from 1992 to 2005 using the CPI-U "All Items" based adjustment factor of 1.37. (U.S. Department of Labor, 2005).

[b] Assumes off-site hauling costs of $62 per trip for a small-small and medium-small facilities and $151 per trip for a large-small facility.

[c] Assumes monthly inspection takes 14 minutes per month in a small-small facility, 18 minutes per month in a medium-small facility, and 23 minutes per month in a large-small and large facility.

[d] Totals have been rounded to nearest $10 in 1992$ and inflated to 2005$ using CPI-U "All Items" therefore the totals may not add due to rounding and inflation. It is assumed that secondary containment structures are completed by the end of year 3, with the facility in compliance at the beginning of year 4. Intermittent costs expected to occur every 5 years incurred in years 8, 13, and 18 of the 20-year period of analysis. If, on average, secondary containment structures have a useful life of 20 years, intermittent costs beyond year 20 will be associated with a replacement structure.

Table H.3. Capital Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facilities to Install NEW Secondary Containment of Indoor Bulk Liquid Pesticides, 2005$ [a]

Capital Cost	$/Unit	$/Facility		
		Small-Small Representative Facility	Medium-Small Representative Facility	Large-Small and Large Represent. Facility
INDOOR SECONDARY CONTAINMENT, BULK LIQUIDS				
Concrete pad [b]	----	---	---	---
Berm [c]	9.53/ft - 17.82/ft	876	876	1,124
Rinsate/precipitation tank [d]	342-1,301/each	342	589	1,301
Portable pump and hose	411/each	411	411	411
Pipes and fixtures	2% of direct costs	33	38	57
Contractor's fees	25% of direct costs	407	469	709
Contingency	5% of direct costs+fees	102	117	177
TOTAL, Year 3 [e]		**2,170**	**2,500**	**3,780**

[a] Costs inflated from 1992 to 2005 using the CPI-U "All Items" (U.S. Department of Labor, 2005)

[b] No costs are incurred for a concrete pad because it is assumed that all existing indoor tanks are already installed over a concrete floor.

[c] The cost of the berm for all sizes of facilities will range from $9.53 to $17.82 per foot, depending on the berm height (smaller units have to have a higher berm to contain the required volume). The higher the berm, the higher the unit cost. For this analysis, the following berm costs were assumed across facilities: $17.82/ft (small-small); $9.53/ft to $17.82/ft (medium-small); $9.53/ft (large-small, large).

[d] Unit costs for an indoor rinsate/precipitation storage tank are estimated at $342 (small-small), $589 (medium-small) to $1,301 (large-small, large).

[e] Totals have been rounded to nearest $10 in 1992$ and inflated to 2005$ using CPI-U "All Items" therefore the totals may not add due to rounding and inflation. It is assumed that secondary containment structures are completed by the end of year 3, with the facility in compliance at the beginning of year 4. Capital costs are expected to occur at the end of year 3.

Table H.4. Operating and Management and Intermittent Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facilities to Install NEW Secondary Containment of Indoor Bulk Liquid Pesticides, 2005$ [a]

O&M or Intermittent Cost	$/Unit	$/Facility		
		Small-Small Representative Facility	Medium-Small Representative Facility	Large-Small and Large Represent. Facility
INDOOR SECONDARY CONTAINMENT, BULK LIQUIDS				
Operating and management (O&M) costs				
Spill cleanup	28/hr	668	950	1,361
Monthly inspection/ recordkeeping [b]	28/hr	77	103	128
Total O&M, Years 4-20 [a]		**740**	**1,050**	**1,490**
Intermittent (every 5 years) costs				
Repair cracks/gaps/seams	2.84/ft	41	96	110
Contractor's fees + contingency	20% intermittent costs	8	19	22
Total intermittent, Years 8, 13, and 18 [a]		**50**	**120**	**130**

[a] All totals have been rounded to the nearest $10. The cost analysis is conducted for a 20-year period, beginning with the year the regulations become effective. Pesticide bulk storage facilities without secondary containment structures must have them built by the compliance date, which is at the end of the third year after the effective date of the regulations. Thus, it is assumed that secondary containment structures are completed by the end of year 3, with the facility in compliance at the beginning of year 4. Intermittent costs are expected to occur every 5 years after completion of the structure, i.e., in years 8, 13 and 18 of the 20-year period of analysis.

[b] Costs inflated from 1992 to 2005 using the CPI-U "All Items" (U.S. Department of Labor, 2005).

Table H.5. Capital Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Secondary Containment of Stationary Dry Bulk Storage, 2005$ [a]

Capital Costs	Unit Cost	Storage of Dry Bulk Pesticide ($/Facility)
		One Dry Bulk Container
SECONDARY CONTAINMENT, BULK SOLIDS:		
Additional concrete pad (floor) [b]	5.48/ft	1,096
6-inch berm	13.74/ft	1,630
Grout	1.24/ft	151
Rinsate/precipitation tank [c]	589/each	589
Reinforcement bars	3.02/ft	370
Contractor's fees	30% of direct costs	1,150
Contingency	5% of direct costs + fees	249
TOTAL, Year 3 [d]		**5,230**

[a] Costs inflated from 1992 to 2005 using the CPI-U "All Items" (U.S. Department of Labor, 2005).
[b] Assumes that there is a concrete pad under every stationary dry bulk container, and that the pad is extended outwards as necessary.
[c] A medium-sized rinsate/precipitation storage tank is assumed.
[d] All totals have been rounded to the nearest $10. It is assumed that secondary containment structures are completed by the end of year 3, with the facility in compliance at the beginning of year 4. Capital costs are expected to occur at the end of year 3.

Table H.6. Operating and Management (Annual) and Intermittent Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facilities to Install NEW Secondary Containment of Stationary Dry Bulk Pesticide Storage, 2005$ [a]

O&M or Intermittent Costs	$/Unit	Storage of Dry Bulk Pesticide ($/Facility)
		One Dry Bulk Container
SECONDARY CONTAINMENT, BULK SOLIDS:		
Operating and management (O&M) costs		
Spill cleanup	28/hr	668
Rinsate/precipitation pumping [b]	28/hr	103
Monthly inspection/recordkeeping	28/hr	77
Total O&M, Years 4-20		**850**
Intermittent (every 5 years) costs		
Repair cracks/gaps/seams	2.84/ft	82
Contractor's fees and contingency	20% of intermittent costs	16
Total intermittent, Years 8, 13 and 18 [c]		**100**

[a] Costs inflated from 1992 to 2005 using the CPI-U "All Items" (U.S. Department of Labor, 2005).

[b] All collected rinsate/precipitation is assumed stored in minibulks or a storage container until it can be used as make-up water.

[c] All totals have been rounded to the nearest $10. The cost analysis is conducted for a 20-year period, beginning with the year the regulations become effective. Pesticide bulk storage facilities without secondary containment structures must have them built by the compliance date, which is at the end of the third year after the effective date of the regulations. Thus, it is assumed that secondary containment structures are completed by the end of year 3, with the facility in compliance at the beginning of year 4. Intermittent costs are expected to occur every 5 years after completion of the structure, i.e., in years 8, 13 and 18 of the 20-year period of analysis.

Table H.7. Capital Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Outdoor Containment Units and Pads, 2005$ (Scenarios 1 & 2) [a]

Capital Cost	$/Unit	All Affected Facilities, Outdoor Storage [b] ($/Facility)		
		Small Pad (15' x 30')	Medium Pad (25' x 50')	Large Pad (60' x 50')
OUTDOOR CONTAINMENT PADS				
Scenario 1: Facilities requiring both secondary containment and a containment pad for compliance				
Concrete pad	5.48/sq ft	2,876	8,902	20,955
Berm	2.74/ft, forms 1.78/sq ft, concrete 1.24/ft, grout	548	822	1,233
Sump	274-411 each	274	411	411
Rinsate/precipitation storage tank [c,d]	589-2,356/each	589	1,657	2,356
Contractor's fees	30% of direct costs	1,286	3,538	7,486
Contingency	5% of direct costs+fees	279	767	1,622
Total, Scenario 1, Year 3 [e]		**5,850**	**16,100**	**34,060**
Scenario 2: Facilities requiring only a containment pad for compliance				
Concrete pad	5.48/sq ft	2,876	9,972	20,955
Berm	2.74/ft, forms 1.78/sq ft, concrete 1.24/ft, grout	548	822	1,233
Sump	274-410 each	274	411	411
Rinsate/precipitation storage tank [c,d]	589-2,356/each	589	1,657	2,356
Portable pump and hose	548/each	548	548	548
Contractor's fees	30% of direct costs	1,450	4,023	7,651
Contingency	5% of direct costs+fees	314	872	1,658
Total, Scenario 2, Year 3 [e]		**6,600**	**18,310**	**34,810**

[a] Costs inflated from 1992 to 2005 using the CPI-U "All Items" (U.S. Department of Labor, 2005).

[b] All agricultural refiller outdoor facilities needing a containment pad will incur costs for either the small or the medium pad, whichever is appropriate. All commercial aerial applicators will incur costs for the large pad. The size of the representative facility, i.e., small, medium or large, does not affect the cost of the pad. Rather, the operational activities associated with a given facility determine whether a small, medium, or large pad is needed.

[c] Costs for a portable pump and hose are not included under this scenario to avoid double-counting. It is assumed the same pump can be used for both secondary containment structures and containment pads, and costs for the pump are included in the capital cost tables for secondary containment structures. For this reason, costs under Scenario 1 are less than that estimated for Scenario 2.

[d] This analysis assumes that rinsate/precipitation storage tank size (volume) will vary by containment pad size, i.e., small pads will require smaller storage tanks ($589), medium pads will require medium tanks ($1,657), and large pads will require larger tanks ($2,356). The costs may apply to single, large tanks as shown, or to multiple smaller tanks.

[e] All totals have been rounded to the nearest $10. It is assumed that secondary containment structures are completed by the end of year 3, with the facility in compliance at the beginning of year 4. Capital costs are expected to occur at the end of year 3.

Table H.8. Capital Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Containment Pads, 2005$ [a]

Capital Cost	$/Unit	$/Facility		
		Small Pad (15' x 30')	Medium Pad (25' x 50')	Large Pad (60' x 50')
INDOOR CONTAINMENT PADS				
Scenario 1: Use existing concrete floor as base for new pad				
Berm	3.38/sq ft, rough up concrete 2.74/ft, forms 2.53-419/sq ft, concrete 1.24/ft, grout 3.02/ft, #4 reinforcing bars	4,000	12,174	28,899
Rinsate storage tank [b]	342-1,301/each	342	589	1,301
Concrete ramp	1.26/sq ft, rough up concrete 0.71/sq ft, bonding agent 268/cu yd, concrete	685	959	6,848
Contractor's fees	30% of direct costs	1,508	4,117	11,114
Contingency	5% of direct costs+fees	327	892	2,408
Total, Scenario 1, Year 3 [c]		**6,860**	**18,730**	**50,570**

Table H.8. Capital Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Containment Pads, 2005$ [a] (Continued)

Capital Cost	$/Unit	$/Facility		
		Small Pad (15' x 30')	Medium Pad (25' x 50')	Large Pad (60' x 50')
Scenario 2: Demolish existing concrete floor; construct sloped pad				
New concrete, allow for sloping	1.26/sq ft, rough up concrete 0.71/sq ft, bonding agent	5,684	16,558	37,732
Demolish and dispose existing concrete	268/cu yd, concrete 342/ea., mob/demob equipment 5.66/sq ft, demolition 4.10/cu yd, loading			
Concrete pad	54.24/ton, transport and dispose 5.48/sq ft			
Sump (includes coating)	411/each	411	411	411
Rinsate storage tank [b]	342-1301/each 2/	342	589	1,301
Contractor's fees	30% of direct costs, excluding transport and disposal	1,931	5,267	11,833
Contingency	5% of direct costs+fees	418	1,141	2,564
Total, Scenario 2, Year 3 [c]		**8,790**	**23,970**	**53,840**

[a] Costs inflated from 1992 to 2005 using the CPI-U "All Items" based adjustment factor of 1.37. (U.S. Department of Labor, 2005).

[b] This analysis assumes that rinsate/precipitation storage tank size (volume) will vary by containment pad size, i.e., small pads will require smaller storage tanks ($342), medium pads will require medium tanks ($589), and large pads will require larger tanks ($1301). The costs may apply to single, large tanks as shown, or to multiple smaller tanks.

[c] All totals have been rounded to the nearest $10. It is assumed that secondary containment structures are completed by the end of year three, with the facility in compliance at the beginning of year four. Capital costs are expected to occur at the end of year three.

Table H.9. Operating and Management (Annual) and Intermittent Costs of Compliance with Containment Regulation for Small-Small, Medium-Small, Large-Small and Large Agricultural Refilling Representative Facility to Install NEW Containment Pad Regulations for Indoor and Outdoor Storage Facilities, 2005$ [a]

O&M or Intermittent Cost	$/Unit	$/Facility		
		Small Pad (15' x 30')	Medium Pad (25' x 50')	Large Pad (60' x 50')
OUTDOOR CONTAINMENT PADS				
Operating and management (O&M) costs				
Spill cleanup	28/hr	668	1,027	1,361
Rinsate/precipitation pumping	28/hr	154	154	591
Rinsate/precipitation off-site	150.1/trip	265	905	3,017
Monthly inspection/recordkeeping	28/hr	103	128	128
Total O&M, Years 4–20		**1,190**	**2,210**	**5,100**
Intermittent (every 5 years) costs [b]				
Repair cracks/gaps/seams	2.84/ft	34	41	55
Contractor's fees and contingency	20% of intermittent costs	7	8	11
Total Intermittent, Years 8, 13, and 18		**40**	**50**	**70**
INDOOR CONTAINMENT PADS				
Operating and management (O&M) costs				
Spill cleanup	28/hr	668	1,027	1,361
Monthly inspection/recordkeeping	28/hr	77	77	128
Total O&M, Years 4–20		**740**	**1,100**	**1,490**
Intermittent (every 5 years) costs [b]				
Repair cracks/gaps/seams	2.74/ft	34	41	55
Contractor's fees and contingency	20% of intermittent costs	7	8	11
Total Intermittent, Years 8, 13, and 18		**40**	**50**	**70**

[a] Costs inflated from 1992 to 2005 using the CPI-U "All Items". (U.S. Department of Labor, 2005).

[b] Given that new structures must be in place within 3 years of the effective date of the regulations (by the end of year 3), intermittent repairs are assumed to be needed in years 8, 13, and 18 of the 20-year period of analysis. All totals have been rounded to the nearest $10.

Table H.10. Capital, O&M, and Intermittent Costs of Compliance with Containment Regulations for Small-Small, Medium-Small, and Large-Small Commercial Aerial and Ground Applicator Facility to Install NEW Outdoor Secondary Containment Structures, 2005$ [a,b]

Representative Aerial Applicator Facility Size	Total Bulk Storage Capacity (Gal.)	All Affected Facilities ($)		
		Capital costs for secondary containment [c]	O&M costs for secondary containment [c]	Intermittent costs for secondary containment [c]
Commercial Aerial Applicators[d]				
Small-Small	1,500	5600	1160	50
Medium-Small	4,000	10300	1550	120
Large-Small	10,000	18250	2790	130
Commercial Ground Applicators[e]				
Small-Small	na	na	na	na
Medium-Small	na	na	na	na
Large-Small	10,000	10,300	1550	120

[a] Costs inflated from 1992 to 2005 using the CPI-U "All Items" (U.S. Department of Labor, 2005).

[b] Independent commercial (for-hire) aerial and ground applicators. All bulk storage facilities are assumed outdoors, and no facilities are expected to store bulk quantities of dry pesticides (i.e., no known containers with a capacity greater than 2 metric tons).

[c] The cost analysis is conducted for a 20-year period, beginning with the year the regulations become effective. Pesticide bulk storage facilities without secondary containment structures must have them built by the compliance date, which is at the end of the third year after the effective date of the regulations. Thus, it is assumed that secondary containment structures are completed by the end of year 3, with the facility in compliance at the beginning of year 4. Capital costs therefore are incurred at the end of year 3 and operating and maintenance costs are incurred in years 4-20. Intermittent costs are expected to occur every 5 years after completion of the structure (i.e., in years 8, 13, and 18 of the 20-year period of analysis).

[d] For lack of better information, small-small, medium-small, and large-small representative aerial applicator facilities are assumed to have the same secondary containment costs as the small-small, medium-small, and large-small representative agricultural refillers. See Tables H.1 and H.2.

[e] It is assumed that only large-small commercial ground applicator businesses will be affected by the rule. For lack of better information, large ground applicators are assumed to incur the same level of costs as medium-sized agricultural refillers. See Tables H.1 and H.2.

Table H.11. Capital, Initial, O&M and Intermittent Costs of Compliance with Containment Regulations by Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators to Retrofit EXISTING Secondary Containment Structures, 2005$ [a]

Critical standards retrofitting cost element for existing secondary containment structures	Type of cost [b]	Unit cost ($/unit)	Agricultural refillers (refilling establishments)				Commercial (for-hire) applicators			
				Costs of compliance by facility size (in $)				Costs of compliance by facility size (in $)		
			Number of Facilities Affected [c]	Small- Small	Medium- Small	Large- Small, Large	Number of Facilities Affected	Small- Small	Medium- Small	Large- Small
Secondary containment for stationary bulk liquid containers [f]										
1. Seal floor drain/discharge outlet	Initial (Year 3)									
Labor		54.78/hr		55	55	55		55	55	55
Grout		11.41/cu ft		11	11	11		11	11	11
Portable pump and hose		548/each		548	548	548		548	548	548
Contractor's fees		15% of direct costs		92	92	92		92	92	92
Contingency		5% of direct costs and fees		35	35	35		35	35	35
Total [d]			**333**	**740**	**740**	**740**	**8**	**740**	**740**	**740**
2. Repair all cracks/gaps/seams	Initial and intermittent (Years 3, 8, 13, and 18)									
Rout crack(s); clean, grout & tamper		2.84/ft		34	93	113		34	93	113
Contractor's fees		15% of direct costs		5	14	17		5	14	17
Contingency		5% of direct costs and fees		2	5	7		2	5	7
Total [d]			**295**	**40**	**110**	**140**	**0**	**40**	**110**	**140**
3. Monthly inspection/records of inspection and maintenance [e]	O&M (Years 4-20)	28/hr	**1,602**	**30**	**30**	**30**	**62**	**30**	**30**	**30**

Table H.11. Capital, Initial, O&M and Intermittent Costs of Compliance with Containment Regulations by Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators to Retrofit EXISTING Secondary Containment Structures, 2005$ [a] (Continued)

Critical standards retrofitting cost element for existing secondary containment structures	Type of cost [b]	Unit cost ($/unit)	Agricultural refillers (refilling establishments)				Commercial (for-hire) applicators			
				Costs of compliance by facility size (in $)				Costs of compliance by facility size (in $)		
			Number of Facilities Affected [c]	Small-Small	Medium-Small	Large-Small, Large	Number of Facilities Affected	Small-Small	Medium-Small	Large-Small
Secondary containment for stationary dry bulk containers [f]										
1. Repair all cracks/gaps/seams (one container)	Initial and intermittent (Years 3, 8, 13, and 18)									
Rout crack(s); clean, grout & tamper		2.84/ft		----	83	83		----	----	----
Contractor's fees		15% of direct costs		----	13	13		----	----	----
Contingency		5% of direct costs and fees		----	5	5		----	----	----
Total [d]			**15**	**----**	**100**	**100**	**0**	**----**	**----**	**----**
2. Monthly inspection/records of inspection and maintenance [e]	O&M (Years 4-20)	24/hr	**70**	**----**	**30**	**30**	**0**	**----**	**----**	**----**

[a] Costs inflated from 1992 to 2005 using the CPI-U "All Items" (U.S. Department of Labor, 2005).

[b] Initial costs will be incurred during Year 3 in order to be in compliance with the critical standards by the beginning of Year 4 (the first year the critical standards are effective for existing facilities). O&M costs will be incurred each year of the Year 4-Year 20 period in this analysis. Intermittent costs are incurred once every 5 years.

[c] See Table G.4

[d] All totals have been rounded to the nearest $10.

[e] Assumes one hour for monthly inspection and recordkeeping. Rounded up to nearest $10.

[f] Only Medium-Small, Large-Small and Large agricultural refillers are assumed to have bulk dry containers.

Table H.12. Capital, Initial, O&M and Intermittent Costs of Compliance with Containment Regulations by Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators to Retrofit EXISTING Containment Pads, 2005$ [f]

Critical Standards Retrofitting Cost Element For Containment Pads	Estimated Number of Facilities Affected		Type of Cost [b]	Unit Cost ($/Unit)	Cost by Size of Containment Pad ($) [c]		
	Agchem refillers [a]	Indep. Apps [a]			Small Pad (15'x30')	Medium Pad (25'x50')	Large Pad (60'x50')
1. Seal drain	263	7	Initial (Year 3) [d]				
Labor				54.78/hr	55	55	55
Grout				11.41/cu ft	11	11	11
Contractor's fees				15% direct costs	10	10	10
Contingency				5% of direct costs and fees	4	4	4
Total					**80**	**80**	**80**
2. Add sump	343	11	Capital (Year 3) [d]				
Cut concrete for sump				4.95/ft	70	79	79
Demolish concrete - sump area				5.66/sq ft	68	90	90
Sump construction:							
Excavation				5.14/cu yd	5	9	10
Gravel				15.28/cu yd	14	16	18
Reinforced concrete				268/cu yd	128	163	193
Steel edge (frame)				11.58/ft	70	93	93
Grate				6.76/sq ft	15	28	28
Additional berm:							
Rough concrete/bond agent				4.10/sq ft	352	582	885
Concrete forms				2.74/ft	235	389	592
Reinforcement bars				3.02/ft			663
Concrete forms				1.78-3.02/sq ft	153	254	653
Grout				1.24/ft	103	177	264
Contractor's fees				30% direct costs	364	564	1,070
Contingency				5% of direct costs and fees	79	122	232
Total					**1,660**	**2,560**	**4,870**
3. Repair cracks/gaps/seams	185	0	Initial and intermittent (Years 3, 8, 13 and 18) [d]				
Rout crack(s); clean, grout				2.84/ft	29	48	56
Contractor's fees				15% direct costs	4	7	8
Contingency				5% of direct costs and fees	2	3	3
Total					**30**	**60**	**70**
4. Monthly inspection/ Records of inspection and maintenance [e]	1445	57	O&M (Years 4-20) [d]	28/hr	**30**	**30**	**30**

Table H.12. Capital, Initial, O&M and Intermittent Costs of Compliance with Containment Regulations by Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators to Retrofit EXISTING Containment Pads, 2005$ [f] (Continued)

[a] See Table 3.2.

[b] Initial costs will be incurred during Year 3 in order for containment pads to be in compliance with the critical standards by the beginning of Year 4 (the first year the full standards are effective for existing facilities). Capital costs will also be incurred in Year 3 to allow for compliance by Year 4. Intermittent costs will occur every 5 years. O&M costs will occur each year of the full standards period.

[c] Existing containment pads vary widely in size. For purposes of analysis, three general sizes are assumed. The two pads sized 15'x30' and 25'x50' are representative of pads used by agricultural refillers (refilling establishments). The pad sized 60'x50' is appropriate for aerial applicators.

[d] The cost analysis is conducted for a 20-year period, beginning with the year the regulations become effective. Pesticide bulk storage facilities with existing secondary containment structures must have them brought into compliance by the compliance date, which is at the end of the third year after the effective date of the regulations. Thus, it is assumed that existing containment structures are modified by the end of Year 3, with the facility in compliance at the beginning of Year 4. Capital costs therefore are incurred at the end of year 3 and operating and maintenance costs are incurred in years 4-20. Intermittent costs are expected to occur every 5 years after modification of the structure, i.e., in Years 8, 13 and 18 of the 20-year period of analysis.

[e] Assumes one hour a year to walk to containment pad and back, conduct a visual inspection, and make necessary entries in log.

[f] Costs inflated from 1992 to 2005 using the CPI-U "All Items" (U.S. Department of Labor, 2005). All totals are rounded up to the nearest $10.

Table H.13. Capital, Initial, O&M and Intermittent Costs of Compliance with Containment Regulations by Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators to Retrofit EXISTING Liquid Bulk Containers, 2005$ [e]

Full Standards Retrofitting Cost Element for Bulk Containers in Existing Secondary Containment Structures	Potential Number of Facilities Affected [a]		Type of cost	Unit Cost ($/Unit)	Incremental Costs of Compliance by Capacity of Affected Bulk Containers ($) [b]			
	Agchem refillers	Commercial applicators			Small-Small	Medium-Small	Large-Small	Large
Bulk Liquid Containers, Plastic								
1. Anchor containers	174	2	Initial (Year 3) [d]					
Move container, labor for drilling in anchors, alter plumbing				479/container	479	479	479	479
Contractor's fees				15% direct costs	72	72	72	72
Contingency				5% of direct costs and fees	28	28	28	28
Total [b]					**580**	**580**	**580**	**580**
2. Monthly inspection/records of inspection and maintenance	3,725	38	O&M (Years 4-20) [d]	28/hr	**30**	**30**	**30**	**30**
Bulk Liquid Containers, Steel								
1. Anchor containers	194	2	Initial (Year 3) [d]					
Move tank, labor for drilling in anchors, alter plumbing				479/container	479	479	479	479
Contractor's fees				15% direct costs	72	72	72	72
Contingency				5% of direct costs and fees	28	28	28	28
Total [b]					**580**	**580**	**580**	**580**
2. Monthly inspection/records of inspection and maintenance [c]	401	4	O&M (Years 4-20) [d]	28/hr	**30**	**30**	**30**	**30**

[a] See Table 3.2. The number of containers is based on the assumption of the number of containers, by type, and the assumption on the percentage of containers in compliance with specific aspects of the regulation in the proposed RIA (EPA, 1993a).

[b] All totals have been rounded to the nearest $10.

[c] Costs included in this line item allow 5 minutes per container per month to visually inspect the container and make necessary entries in a log. Facilities with more than one bulk container will incur multiples of this cost. Rounded to nearest $10.

Table H.13. Capital, Initial, O&M and Intermittent Costs of Compliance with Containment Regulations by Representative Facility Size for Agricultural Refillers and Commercial Aerial and Ground Applicators to Retrofit EXISTING Liquid Bulk Containers, 2005$ [e]

[d] The cost analysis is conducted for a 20-year period, beginning with the year the regulations become effective. Pesticide bulk storage facilities with existing secondary containment structures must have them brought into compliance by the compliance date, which is at the end of the third year after the effective date of the regulations. Thus, it is assumed that existing containment structures are modified by the end of Year 3, with the facility in compliance at the beginning of Year 4. Capital costs therefore are incurred at the end of year 3 and operating and maintenance costs are incurred in years 4-20. Intermittent costs are expected to occur every 5 years after modification of the structure, i.e., in Years 8, 13 and 18 of the 20-year period of analysis.

[e] Costs inflated from 1992 to 2005 using the CPI-U "All Items" (U.S. Department of Labor, 2005).

Appendix I. Facility Annualized Costs as a Share of Annual Revenue

Table I.1. Total Facility Annualized Costs as a Share of Annual Revenue to Install New Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 3% Discount Rate

	Impacted facilities [a]	Facility-Level Annualized Costs ($/facility)	Annual Cost-Revenue Ratio (%)
AGRICULTURAL REFILLER [b]			
Outdoor Liquid Bulk Storage			
(A) Both secondary containment and pad			
Small [c]	321	2,680	0.14
Small-Small	270	2,544	0.34
Medium-Small	46	3,133	0.05
Large-Small	5	5,983	0.03
Large	3	5,983	0.003
(B) Containment pad only			
Small	238	1,358	0.07
Small-Small	200	1,335	0.18
Medium-Small	34	1,335	0.02
Large-Small	4	2,838	0.01
Large	2	2,838	0.002
Outdoor Dry Bulk Storage			
(A) Both secondary containment and pad			
Small	23	4,858	0.05
Small-Small	0	n/a	na
Medium-Small	17	4,483	0.07
Large-Small	6	5,983	0.03
Large	6	5,983	0.003
Indoor Liquid Bulk Storage			
(A) Both secondary containment and pad			
Small	138	1,780	0.10
Small-Small	116	1,715	0.23
Medium-Small	20	1,988	0.03
Large-Small	2	3,405	0.02
Large	1	3,405	0.002
(B) Containment pad only			
Small	102	1,130	0.06
Small-Small	86	1,112	0.15
Medium-Small	15	1,112	0.02
Large-Small	2	2,303	0.01
Large	1	2,303	0.001
Nonbulk Activities			
(A) Containment pad only			
Small	561	1,335	0.18
Small-Small	561	1,335	0.18
Medium-Small	n/a	na	na
Large-Small	n/a	na	na
Large	n/a	na	na

Table I.1. Total Facility Annualized Costs as a Share of Annual Revenue to Install New Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 3% Discount Rate (Continued)

	Impacted facilities	Facility-Level Annualized Costs ($/facility)	Annual Cost-Revenue Ratio (%)
COMMERCIAL APPLICATORS [d]			
Outdoor Liquid Bulk Storage			
(A) Both secondary containment and pad			
Small	16	7,743	2.72
Small-Small	6	7,307	7.77
Medium-Small	9	7,903	2.11
Large-Small [e]	1 (5)	9,375 (4,567)	1.25 (0.61)
(B) Containment pad only			
Small	10	6,098	1.25
Small-Small	n/a	na	na
Medium-Small	7	6,098	1.63
Large-Small [e]	3 (3)	6,106 (2,840)	0.81 (0.38)

[a] Impacted facilities taken from Table G.4.

[b] Small facility ($1.8 million annual revenue); small-small representative facility ($800,000 annual revenue); medium-small representative facility ($6.7 million annual revenue); large-small representative facility ($22.7 million annual revenue); large representative facility ($191.6 million annual revenue). See Table 3.3.

[c] The small size category is comprised of small-small, medium-small, and large-small facilities. Total impacted facilities are the sum of the facilities in each size sub-category. The facility-level annualized cost for small facilities is the average of costs for each size sub-category, weighted by the number of facilities in each size sub-category. The revenue used to calculate the small annual cost--revenue ratio is the average of facility revenue for each size sub-category, again weighted by the number of facilities in each size sub-category.

[d] Small facility ($280,000 annual revenue); small-small representative facility ($100,580 annual revenue); medium-small representative facility ($401,250 annual revenue); large-small representative facility ($802,500 annual revenue). See Table 3.5.

[e] Impact estimates for large ground operators shown in parentheses. The financial profile of a large-small ground applicator is assumed to be similar to that of a medium-small aerial applicator.

Table I.2. Total Facility Annualized Costs as a Share of Annual Revenue to Install New Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 7% Discount Rate

	Impacted facilities [a]	Facility-Level Annualized Costs ($/facility)	Annual Cost-Revenue Ratio (%)
AGRICULTURAL REFILLER [b]			
Outdoor Liquid Bulk Storage			
(A) Both secondary containment and pad			
Small [c]	321	2,628	0.14
Small-Small	270	2,487	0.33
Medium-Small	46	3,101	0.05
Large-Small	5	5,988	0.03
Large	3	5,988	0.003
(B) Containment pad only			
Small	238	1,340	0.07
Small-Small	200	1,316	0.18
Medium-Small	34	1,316	0.02
Large-Small	4	2,878	0.01
Large	2	2,878	0.002
Outdoor Dry Bulk Storage			
(A) Both secondary containment and pad			
Small	23	4,826	0.05
Small-Small	n/a	n/a	n/a
Medium-Small	17	4,439	0.07
Large-Small	6	5,988	0.03
Large	6	5,988	0.003
Indoor Liquid Bulk Storage			
(A) Both secondary containment and pad			
Small	138	1,763	0.10
Small-Small	116	1,701	0.23
Medium-Small	20	1,951	0.03
Large-Small	2	3,462	0.02
Large	1	3,462	0.002
(B) Containment pad only			
Small	102	1,178	0.06
Small-Small	86	1,158	0.15
Medium-Small	15	1,158	0.02
Large-Small	2	2,505	0.01
Large	1	2,505	0.001
Nonbulk Activities			
(A) Containment pad only			
Small	561	1,316	0.18
Small-Small	561	1,316	0.18
Medium-Small	n/a	na	na
Large-Small	n/a	na	na
Large	n/a	na	na

Table I.2. Total Facility Annualized Costs as a Share of Annual Revenue to Install New Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 7% Discount Rate (Continued)

	Impacted facilities	Facility-Level Annualized Costs ($/facility)	Annual Cost-Revenue Ratio (%)
COMMERCIAL APPLICATORS [d]			
Outdoor Liquid Bulk Storage			
(A) Both secondary containment and pad			
Small	16	7,717	2.72
Small-Small	6	7,271	7.73
Medium-Small	9	7,884	2.10
Large-Small [e]	1 (5)	9,358 (4,557)	1.25 (0.61)
(B) Containment pad only			
Small	10	6,100	1.25
Small-Small	n/a	na	na
Medium-Small	7	6,100	1.63
Large-Small [e]	3 (3)	6,107 (2,880)	0.81 (0.38)

[a] Impacted facilities taken from Table G.4.

[b] Small facility ($1.8 million annual revenue); small-small representative facility ($800,000 annual revenue); medium-small representative facility ($6.7 million annual revenue); large-small representative facility ($22.7 million annual revenue); large representative facility ($191.6 million annual revenue). See Table 3.3.

[c] The Small size category is comprised of small-small, medium-small, and large-small facilities. Total impacted facilities are the sum of the facilities in each size sub-category. The facility-level annualized cost for small facilities is the average of costs for each size sub-category, weighted by the number of facilities in each size sub-category. The revenue used to calculate the small annual cost-revenue ratio is the average of facility revenue for each size sub-category, again weighted by the number of facilities in each size sub-category.

[d] Small facility ($280,000 annual revenue); small-small representative facility ($100,580 annual revenue); medium-small representative facility ($401,250 annual revenue); large-small representative facility ($802,500 annual revenue). See Table 3.5.

[e] Impact estimates for large ground operators shown in parentheses. The financial profile of a large-small ground applicator is assumed to be similar to that of a medium-small aerial applicator.

Table I.3. Total Facility Annualized Costs as a Share of Annual Revenue to Retrofit Existing Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 3% Discount Rate

	Impacted facilities by Cost Type: [a]				Maximum Facility-Level Annualized Costs ($/facility) [b]	Annual Cost-Revenue Ratio (%)
	Capital	Initial	O&M	Intermittent		
AGRICULTURAL REFILLER [c]						
Bulk Liquid Storage						
Small [d]	0	330	1588	292	74	0.004
Small-Small	0	277	1335	246	73	0.010
Medium-Small	0	47	228	42	83	0.001
Large-Small	0	5	24	4	87	0.000
Large	0	3	15	3	87	0.000
Bulk Dry Storage						
Small	0	0	66	14	37	0.000
Small-Small	n/a	n/a	n/a	n/a	n/a	n/a
Medium-Small	0	0	60	13	n/a	0.001
Large-Small	0	0	6	1	37	0.0002
Large	0	0	4	1	37	0.00002
Containment Pads						
Small	339	260	1432	183	142	0.008
Small-Small	285	219	1204	154	132	0.018
Medium-Small	49	37	206	26	189	0.003
Large-Small	5	4	22	3	329	0.002
Large	3	2	13	2	329	0.0002
Bulk Liquid Container						
Small	0	365	4089	0	58	0.003
Small-Small	0	307	3439	0	58	0.008
Medium-Small	0	53	588	0	58	0.001
Large-Small	0	6	62	0	58	0.0003
Large	0	4	38	0	58	0.00003
Aggregate Facility Impacts [e]						
Small					279	0.015
Small-Small					263	0.035
Medium-Small					367	0.006
Large-Small					510	0.002
Large					510	0.0003
COMMERCIAL APPLICATORS [f]						
Bulk Liquid Storage						
Small	0	8	62	0	79	0.03
Small-Small	0	3	24	0	73	0.08
Medium-Small	0	4	35	0	83	0.02
Large-Small	0	0	3	0	87	0.01

Table I.3. Total Facility Annualized Costs as a Share of Annual Revenue to Retrofit Existing Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 3% Discount Rate (Continued)

	Impacted facilities by Cost Type:				Maximum Facility-Level Annualized Costs ($/facility)	Annual Cost-Revenue Ratio (%)
	Capital	Initial	O&M	Intermittent		
Containment Pads						
Small	11	7	57	0	174	0.06
Small-Small	4	3	22	0	132	0.14
Medium-Small	6	4	32	0	189	0.05
Large-Small	1	0	3	0	329	0.04
Bulk Liquid Container						
Small	0	4	42	0	58	0.02
Small-Small	0	2	17	0	58	0.06
Medium-Small	0	2	24	0	58	0.02
Large-Small	0	0	2	0	58	0.01
Aggregate Facility Impacts						
Small					311	0.11
Small-Small					263	0.28
Medium-Small					330	0.09
Large-Small					473	0.06

[a] Impacted facilities taken from Table G.4. Facilities may only be subject to portions of a particular standard for existing containment structures, therefore we present the number of facilities subject to each type of cost facilities will incur to come into compliance with a standard. For example, 4% of facilities in regulated states and 50% of facilities in unregulated states are expected to add a berm. These facilities will have to incur the initial costs while others will not. Note that a particular facility may be counted more than once in each of the four compliance cost categories (capital, initial, O&M, and intermittent).

[b] We present the maximum compliance cost any facility in a particular size category may face (the sum, if applicable, of capital, initial, O&M, and intermittent costs). This is an overestimate of costs the average facility will face when coming into compliance with a standard, since many facilities will only incur costs associated with portions of a standard.

[c] Small facility ($1.8 million annual revenue); Small-Small representative facility ($800,000 annual revenue); Medium-Small representative facility ($6.7 million annual revenue); Large-Small representative facility ($22.7 million annual revenue); Large representative facility ($191.6 million annual revenue). See Table 3.3.

[d] The Small size category is comprised of Small-Small, Medium-Small, and Large-Small facilities. Total impacted facilities are the sum of the facilities in each size sub-category. The facility-level annualized cost for Small facilities is the average of costs for each size sub-category, weighted by the industry-wide percentage of facilities in each size sub-category. The revenue used to calculate the Small annual cost-revenue ratio is the average of facility revenue for each size sub-category, again weighted by the industry-wide percentage of facilities in each size sub-category.

[e] Due to the way we estimate the number of facilities that are subject to the existing containment standards (see Table G.4), we are unable to estimate the extent to which each impacted facility will incur multiple compliance costs (capital, initial, O&M, and intermittent) associated with a particular standard. We therefore do not present the total number of aggregated facilities impacted by the standards for existing containment structures.

[f] Small facility ($280,000 annual revenue); Small-Small representative facility ($100,580 annual revenue); Medium-Small representative facility ($401,250 annual revenue); Large-Small representative facility ($802,500 annual revenue). See Table 3.5.

Table I.4. Total Facility Annualized Costs as a Share of Annual Revenue to Retrofit Existing Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 7% Discount Rate

	Impacted facilities by Cost Type: [a]				Maximum Facility-Level Annualized Costs ($/facility) [b]	Annual Cost-Revenue Ratio (%)
	Capital	Initial	O&M	Inter-mittent		
AGRICULTURAL REFILLER [c]						
Bulk Liquid Storage						
Small [d]	0	330	1,588	292	80	0.004
Small-Small	0	277	1,335	246	79	0.011
Medium-Small	0	47	228	42	87	0.001
Large-Small	0	5	24	4	90	0.000
Large	0	3	15	3	90	0.000
Bulk Dry Storage						
Small	0	0	66	14	32	0.000
Small-Small	n/a	n/a	n/a	n/a	n/a	n/a
Medium-Small	0	0	60	13	32	0.001
Large-Small	0	0	6	1	32	0.0002
Large	0	0	4	1	32	0.00002
Containment Pads						
Small	339	260	1,432	183	162	0.009
Small-Small	285	219	1,204	154	150	0.020
Medium-Small	49	37	206	26	218	0.003
Large-Small	5	4	22	3	386	0.002
Large	3	2	13	2	386	0.0002
Bulk Liquid Container						
Small	0	365	4,089	0	62	0.003
Small-Small	0	307	3,439	0	63	0.008
Medium-Small	0	53	588	0	63	0.001
Large-Small	0	6	62	0	63	0.0003
Large	0	3	38	0	63	0.00004
Aggregate Facility Impacts [e]						
Small					309	0.017
Small-Small					292	0.039
Medium-Small					400	0.006
Large-Small					571	0.003
Large					571	0.0003
COMMERCIAL APPLICATORS [f]						
Bulk Liquid Storage						
Small	0	8	62	0	84	0.03
Small-Small	0	3	24	0	79	0.08
Medium-Small	0	4	35	0	87	0.02
Large-Small	0	0	3	0	90	0.01
Containment Pads						
Small	11	7	57	0	200	0.07
Small-Small	4	3	22	0	150	0.16
Medium-Small	6	4	32	0	218	0.06
Large-Small	1	0	3	0	386	0.05

Table I.4. Total Facility Annualized Costs as a Share of Annual Revenue to Retrofit Existing Secondary Containment Units and Containment Pads, Agricultural Refillers and Commercial Applicators (2005$), 7% Discount Rate (Continued)

	Impacted facilities by Cost Type:				Maximum Facility-Level Annualized Costs ($/facility)	Annual Cost-Revenue Ratio (%)
	Capital	Initial	O&M	Inter-mittent		
Bulk Liquid Container						
Small	0	4	42	0	63	0.02
Small-Small	0	2	17	0	63	0.07
Medium-Small	0	2	24	0	63	0.02
Large-Small	0	0	2	0	63	0.01
Aggregate Facility Impacts						
Small					347	0.12
Small-Small					292	0.31
Medium-Small					368	0.10
Large-Small					539	0.07

[a] Impacted facilities taken from Table G.4. Facilities may only be subject to portions of a particular standard for existing containment structures, therefore we present the number of facilities subject to each type of cost facilities will incur to come into compliance with a standard. For example, 4% of facilities in regulated states and 50% of facilities in unregulated states are expected to add a berm. These facilities will have to incur the initial costs while others will not. Note that a particular facility may be counted more than once in each of the four compliance cost categories (capital, initial, O&M, and intermittent).

[b] We present the maximum compliance cost any facility in a particular size category may face (the sum, if applicable, of capital, initial, O&M, and intermittent costs). This is an overestimate of costs the average facility will face when coming into compliance with a standard, since many facilities will only incur costs associated with portions of a standard.

[c] Small facility ($1.8 million annual revenue); Small-Small representative facility ($800,000 annual revenue); Medium-Small representative facility ($6.7 million annual revenue); Large-Small representative facility ($22.7 million annual revenue); Large representative facility ($191.6 million annual revenue). See Table 3.3.

[d] The Small size category is comprised of Small-Small, Medium-Small, and Large-Small facilities. Total impacted facilities are the sum of the facilities in each size sub-category. The facility-level annualized cost for Small facilities is the average of costs for each size sub-category, weighted by the industry-wide percentage of facilities in each size sub-category. The revenue used to calculate the Small annual cost-revenue ratio is the average of facility revenue for each size sub-category, again weighted by the industry-wide percentage of facilities in each size sub-category.

[e] Due to the way we estimate the number of facilities that are subject to the existing containment standards (see Table G.4), we are unable to estimate the extent to which each impacted facility will incur multiple compliance costs (capital, initial, O&M, and intermittent) associated with a particular standard. We therefore do not present the total number of aggregated facilities impacted by the standards for existing containment structures.

[f] Small facility ($280,000 annual revenue); Small-Small representative facility ($100,580 annual revenue); Medium-Small representative facility ($401,250 annual revenue); Large-Small representative facility ($802,500 annual revenue). See Table 3.5.