

DEBRIS MANAGEMENT HANDBOOK FOR STATE AND LOCAL DOTs AND DPWs

Final Report

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Author Acknowledgements

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Abstract

This report documents and presents the results of a research effort to develop a handbook for State and local government officials and staff tasked with debris management after a disaster. The handbook is based on best practices, and actionable guidance identified through literature review, State, local, and Federal resources, and field experience of debris management professionals. It is organized by phase of the debris management cycle, including policy, planning, contracts, segregation, monitoring, site selection, removal, disposal, and reimbursement, as well as hazard-specific considerations. The handbook features several case studies drawing on the experience of local, State, and Federal debris managers, offering real-world insight into efficient debris management operations.

Executive Summary

Debris issues are varied, widespread, and costly. They have an immediacy that requires quick decision making in order to clear roadways and provide access for emergency vehicles and rescue operations, as well as unobstructed routes to critical facilities. Debris removal and disposal often constitute the single most costly activity faced by local and State jurisdictions after a major disaster. This report presents the methodology used to develop the *Debris Management Handbook for State and Local Departments of Transportation*, which will serve as:

- A single, comprehensive body of knowledge on academic and practical considerations for debris planning and operations.
- A foundation for developing and refining debris-related planning, operations, and training/exercise options for State and local agencies.
- An intuitive guide toward establishing State and local contracting policies and procedures on debris clearance that are conducive to meeting Federal agency regulations for reimbursement standards.
- A road map toward enhancing overall debris management programs at the State and local levels, potentially reducing the overall costs related to disasters.

The report steps through the two-phased research approach used to develop the handbook, highlighting:

- The **literature review**, which yielded over 160 debris management publications, led to the creation of a searchable database and other tools, and informed the background reports that served as the foundation of the handbook;
- The **review of field experience**, which included a survey of local, State, and Federal debris staff and in-depth interviews with experienced debris managers. The knowledge gained from these practitioners formed the development of case studies highlighting real-world best practices and lessons learned;
- The development of the **handbook** itself, stepping through each phase of the debris management cycle and evaluating hazard-specific considerations; and
- The creation of innovation **tools** designed to aid planning and decision making for debris management operations.

Discussion of conclusions and ideas for future research and development

- Many State and local jurisdictions recognize the benefits of having a debris management plan.
- Pre-event contracts, particularly for debris monitoring, are strongly recommended by jurisdictions that have sought Federal reimbursement for debris removal activities.
- Potential future research topic: Coordination among FAA, FEMA, FHWA, and other Federal, State, and local agencies on debris removal from general aviation airports.

CHAPTER SEQUENCE AND DESCRIPTIONS

Chapter 1: Background

This chapter discusses the challenges associated with debris management, and the gaps in resources that led to the development of the Debris Management Handbook. It includes an overview of the problem statement and scope of this project.

Chapter 2: Research Approach

This chapter presents the two-phased approach used to develop the Debris Management Handbook.

Chapter 3: Findings and Applications

This chapter details the methodologies and outcomes used to create the Debris Management Handbook. It includes a discussion of the literature review and development of background reports; a field survey of State and local debris managers; preliminary and in-depth interviews with debris managers; development of case studies and the handbook itself; and the development of debris management tools.

Chapter 4: Conclusions and Ideas for Future Research and Development

This chapter discusses the final Debris Management Handbook, summarizing key findings. In addition, it describes potential areas for future research and development.

Chapter 1: Background

Debris issues are varied, widespread, and costly. They have an immediacy that requires quick decision making in order to clear roadways and provide access for emergency vehicles and rescue operations, as well as unobstructed routes to critical facilities. Debris removal and disposal often constitute the single most costly activity faced by local and State jurisdictions. Consequently, having a handbook of best practices can be of great benefit to virtually all local public works agencies, facilities managers that are responsible for stormwater systems, State departments of transportation (DOT), and even Federal Emergency Management Agency (FEMA) personnel. This handbook has the potential to serve as:

- A single, comprehensive body of knowledge on academic and practical considerations for debris planning and operations.
- A foundation for developing and refining debris-related planning, operations, and training/exercise options for State and local agencies.
- An intuitive guide toward establishing State and local contracting policies and procedures on debris clearance that are conducive to meeting Federal agency regulations for reimbursement standards.
- A road map toward enhancing overall debris management programs at the State and local levels, potentially reducing the overall costs related to disasters.

Research Problem Statement

One of the first and most critical tasks following any emergency is to clear roadways of debris to ensure that emergency response and evacuation can occur and, eventually, normal transportation operations can resume. Responsibilities for debris management are often shared by local, State, and Federal entities, and many of those entities have developed plans, guidance documents, and field reports outlining operations, lessons learned, and best practices for debris management. However, there is currently no single, consolidated source of information that draws on these multitudes of resources to identify the best-of-the-best practices to help agencies run efficient, cost-effective debris management operations.

Research Objective and Scope

The objective of this research was to develop a handbook containing recommended debris management practices and procedures for use by local, Tribal, and State DOTs and DPWs.

The research scope included a review of literature, plans, and after-action reports related to debris management, as well as a survey of field experience among debris managers. The Research Team applied a systematic approach to published documents to glean best practices and lessons learned, ultimately feeding into the development of a handbook. In addition, the team used a survey of local, State, and Federal debris managers to identify

and develop case studies illustrating the real-world challenges and successes of debris management. The outcomes of these efforts are presented in the chapters that follow.

Chapter 2: Research Approach

The research approach was divided into two phases: Phase I included a review of existing literature and a preliminary survey; Phase II included detailed interviews leading to case studies that highlight best practices for debris management. The end product is a Debris Management Handbook for Local and State Departments of Transportation (DOTs) and Departments of Public Works (DPWs), accompanied by a sortable, searchable literature review database.

Phase I

- *Task 1, Literature Review:* An in-depth analysis of publicly available policies, guidance documents, and academic research relevant to every aspect of debris management, reviewed against a common set of criteria developed in coordination with our Subject Matter Experts (SMEs) and compiled into a searchable database.
- *Task 2, Review of Field Experience:* An in-depth review of publicly available reports on past debris operations included in the Task 1 database. Task 2 also includes a preliminary survey of government employees at all levels and other professionals with debris experience to help identify both additional resources for review and possible interviewees for Phase II.
- *Task 3, Analysis:* An analysis of the results of Tasks 1 and 2 in which themes, gaps, and common challenges will be identified to shape the further development of the handbook. This task will culminate in a summary report outlining the themes, gaps and common challenges for each phase of debris management (policy, planning, operations, reimbursement, and evaluation).
- *Task 4, Outline and Updated Phase II Work Plan:* Development of a preliminary handbook outline based on Tasks 1, 2, and 3, as well as development of an updated work plan to guide Phase II.
- *Task 5, Interim Report:* Development of an interim report to the project panel summarizing the work accomplished in Phase I and the work anticipated in Phase II.

Phase II

- *Task 6, Case Studies:* Development of five to eight case studies based on themes and trends identified in Phase I and supplemented by in-depth interviews with debris management professionals.
- *Task 7, Develop Handbook:* Development of the final handbook based on the outline created in Task 4 and the case studies completed in Task 6.
- *Task 8, Final Report:* Development of a final report, including an executive summary of the project and an implementation plan. All other deliverables will be included or referenced in the final report.

Summary of Approach and Deliverables

The following diagram summarizes each task and the deliverables to be issued at the end of each:

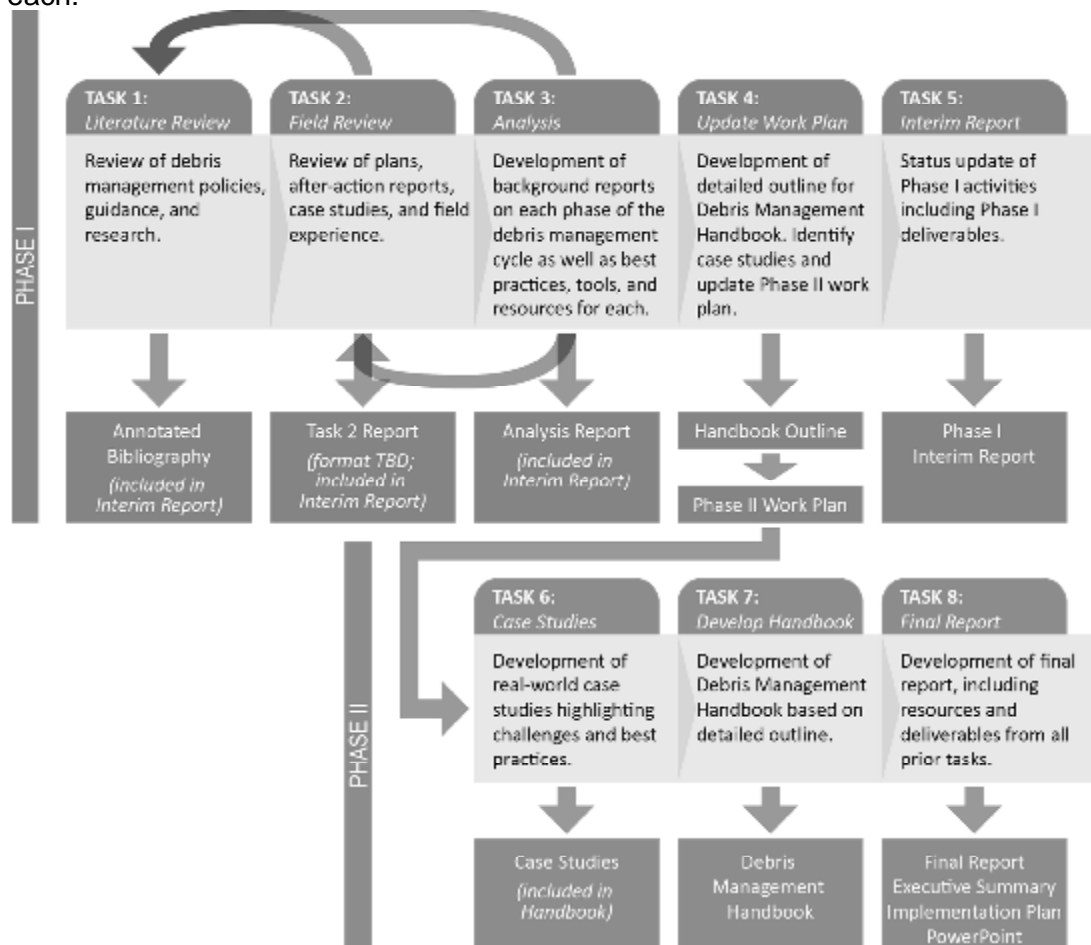


Figure 1 Research Approach Flow Diagram

CHAPTER 3: FINDINGS AND APPLICATIONS

This chapter details the outcomes of the literature review, field analysis, case studies, and handbook development.

Literature Review Findings and Background Reports

The *Annotated Bibliography* compiles information gathered from over 160 publications and plans reviewed between February and July of 2012, supplemented over the course of the development of the handbook. It is the result of the Literature Review Task and serves as the deliverable for Task 1. This document is intended to serve as a quick reference for handbook users looking for additional information.

A description of the methodology used to conduct the literature review is presented in the *Literature Review Methodology Report*. Detailed information about each publication is available in the *Literature Review Database*. Publications are classified by type and presented alphabetically. For each publication (with the exception of plans), a citation and a summary of the audiences, hazards, debris types, phases, and topics discussed in each publication are presented. Only the citations of plans are presented, for confidentiality reasons.

The literature review yielded a great deal of information about debris management. Using the *Literature Review Database*, findings specific to each phase of debris management were included in the *Debris Management Background Reports*. These background reports were used in Phase II to develop the foundation content of the debris management handbook and are included in the appendices.

Background reports were structured around five key questions: why, what, when, who, and how.

- “Why” refers to the reasons that phase is an important consideration in the debris management cycle.
- “What” refers to the outcomes that should occur as part of that phase.
- “When” refers to the point in time at which the cycle was completed.
- “Who” refers to the government, contracting, and other entities involved in the phase.
- “How” refers to the specific actions that can or should be taken to complete the phase.
 - Each “How” section was complemented by a list of publications relevant to that phase identified during the literature review and considered by the reviewer to be both useful and actionable.

Background reports were completed for each of the major debris management phases: disposal, policy, segregation, contracts, monitoring, planning, reimbursement, removal, and site selection. The specific findings of the literature review for each cycle are included in each of those reports, and were supplemented by results from the field survey (discussed below). In general:

- A number of publications are available such as plans, handbooks, guides, and after-action reports related to debris management; however, much of the information is duplicative. Many publications referenced FEMA's *Debris Management Guide* (FEMA 325) and the U.S. Environmental Protection Agency's document entitled *Disaster Debris Management*.
- Areas for which much information existed did not necessarily correspond to areas in which survey respondents were most confident. For instance, FEMA and FHWA have a number of documents that discuss the reimbursement process, yet reimbursement was an area where survey respondents had the least amount of confidence.
- Many of the principles of disaster debris management can be generalized, but many of the specific actions required depend on the type of disaster that occurred. For instance, after September 11, debris management sites were treated as crime scenes, and debris was treated as evidence.
- Interagency coordination as well as delineation of roles and responsibilities were major themes in after-action reports.

After background reports were crafted, a preliminary outline for the handbook was developed. Each background report served as the basis for a chapter in the handbook, with an additional chapter discussing hazard-specific debris considerations.

Field Survey Findings

Analysis was conducted on survey responses received through July 15, 2012, then updated on September 29, 2012, after the survey was closed.

The survey was sent out as a Google form, and survey responses were analyzed in Microsoft Excel. Dewberry's subject matter experts developed survey questions with the following objectives:

1. Identify trends and the "state of the art" of debris management among State and local staff.
2. Identify additional plans and publications for inclusion in the literature review.
3. Identify potential interviewees for expanded case studies to be developed.

The survey is included as an appendix.

Respondents

The survey was emailed to State and local representatives through the following organizations (membership numbers for the organizations are shown in parentheses):

- Transportation Research Board (TRB) state representatives (50)
- International City/County Management Association (ICMA) (9,000)
- American Public Works Association (APWA) (28,600)
- Solid Waste Association of North America (SWANA) (8,000)
- International Association of Emergency Managers (IAEM) (5,000)

Total: 50,650

While most of these organizations have large membership bases, interests of their members vary, meaning a good number of their membership may not deal with debris issues. We did not anticipate a huge response rate and were pleased with the responses we received from a diverse group of respondents. A total of 166 responses were received, mostly representing local governments. The distribution of survey respondents is presented in Figure 2.

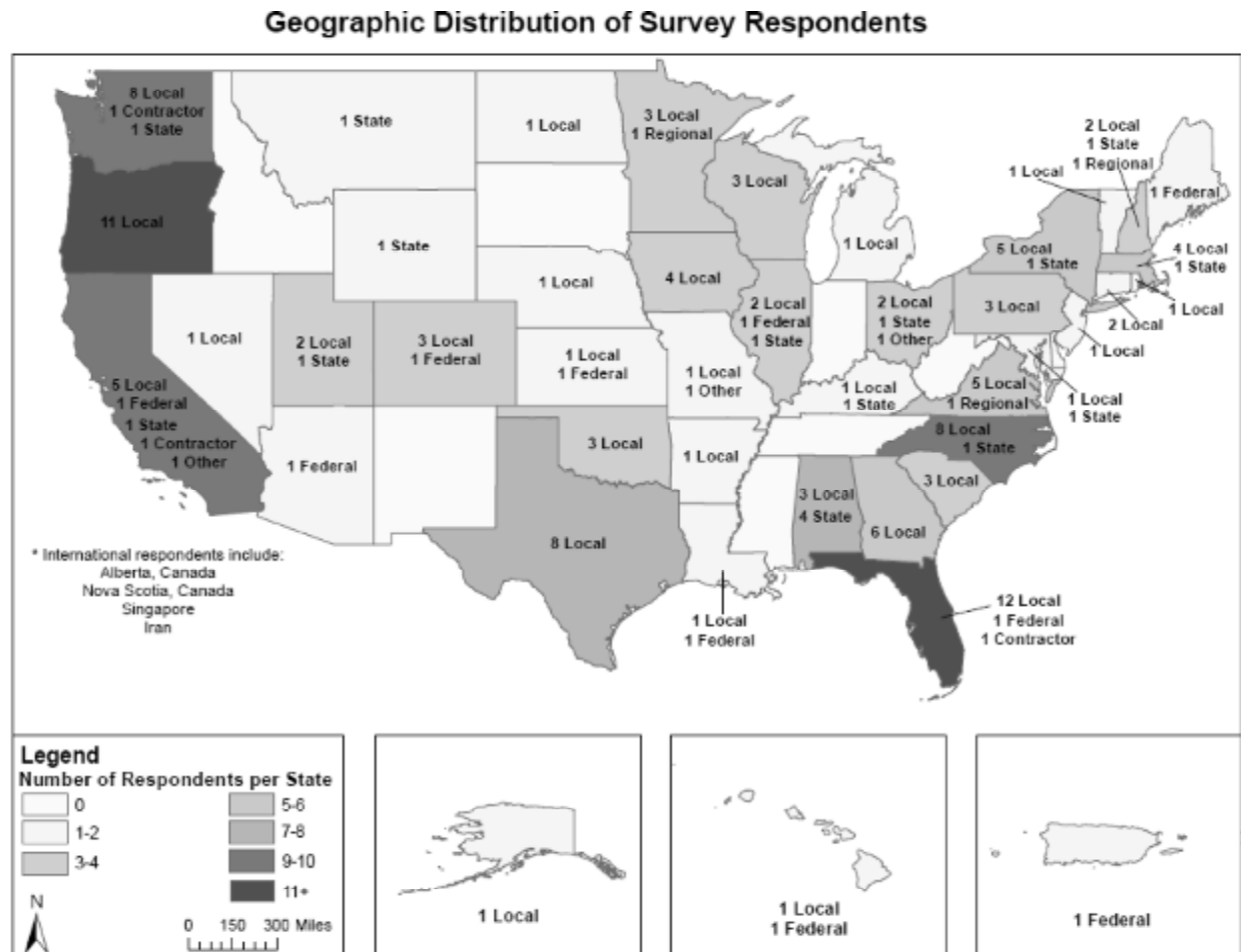


Figure 2: Distribution of Survey Respondents

Local public works represented the highest proportion (43 percent) of survey respondents; and an additional 31 percent of survey respondents represented other local agencies. A small percentage (3 percent) of respondents was from international organizations, including participants in Iran, Singapore, and Canada. Figure 3 shows the distribution of respondents by organization type.

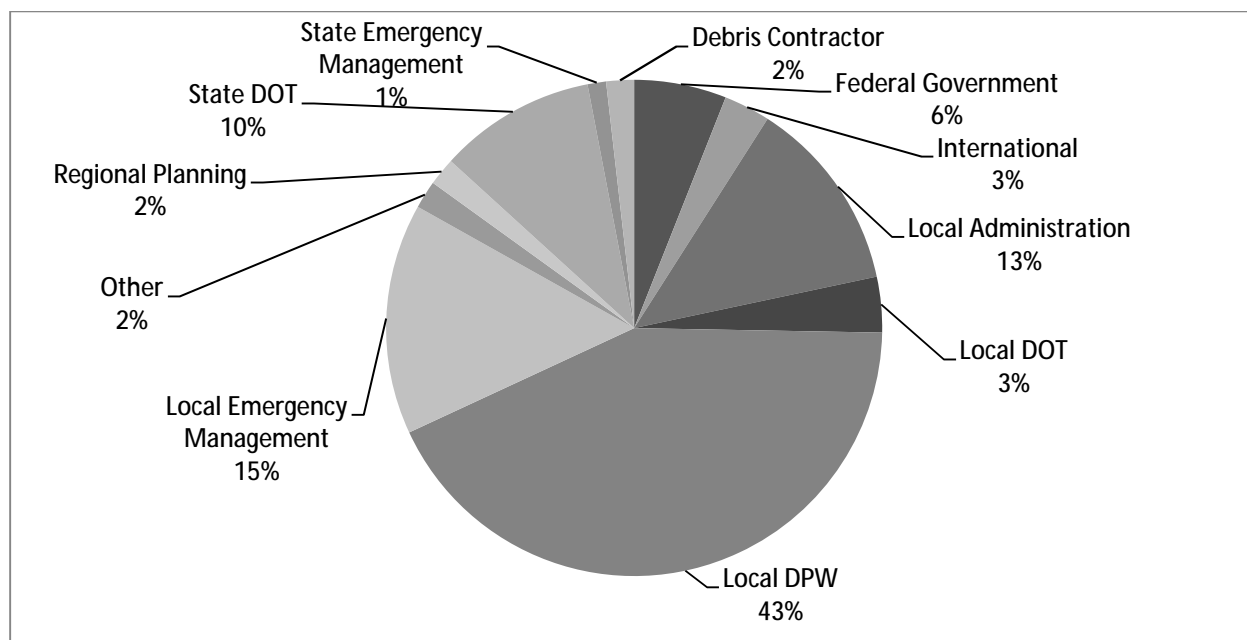


Figure 3: Respondents by Type of Organization

Trends

The following analyses represent trends in all data as of September 29, 2012.

Debris Management Documents

One goal of the survey was to identify the types of publications used by local jurisdictions. Respondents were asked about four types of documents—plans, policies, field experience, and lessons learned documents, and pre-positioned contracts—and were asked to list or provide links to documents for review. The questions were phrased as follows:

- Does your organization have debris management plans?
- Does your organization have debris management policies?
- Does your organization have documents you've prepared that describe your field experience and lessons learned?
- Does your organization have standard, pre-positioned contracts for debris management?

Figure 4 shows the distribution of respondents with plans, policies, lessons learned documents, and pre-positioned contracts. Note that about half of all respondents had plans available and less than one-third of respondents had policies or pre-positioned contracts available. Approximately 11 percent of respondents had prepared field experience or lessons learned documents; many noted that most lessons learned in their organization are not written down.

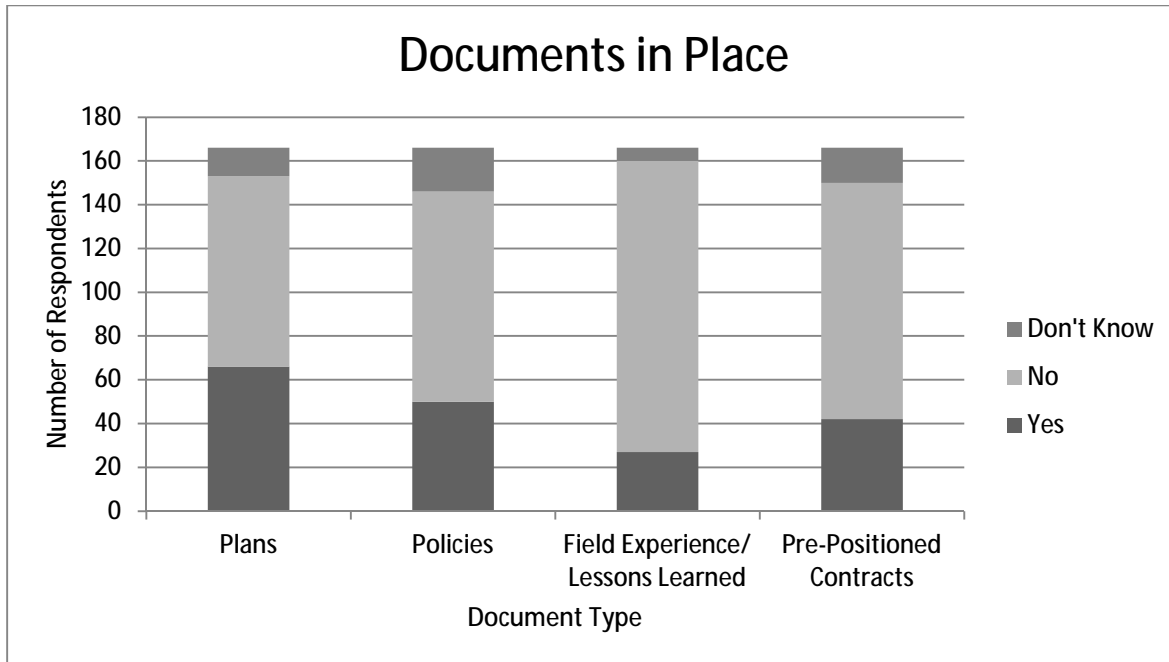


Figure 4: Documents Available to Respondents

Figure 5 and Figure 6 illustrate documents in place for State and local respondents, respectively. Note that more local respondents than State respondents said they had policies in place; similarly, more local respondents than State respondents said they had documents discussing field experience and lessons learned. This may be attributed to the relative sizes of State and local agencies. In smaller, local agencies, one or a few individuals have responsibility for debris management. They may therefore know their own literature better than individuals working for a larger, State agency. Local staff may also have more of a stake in formalizing policies and documenting lessons learned, as they have fewer resources to deal with future debris management events.

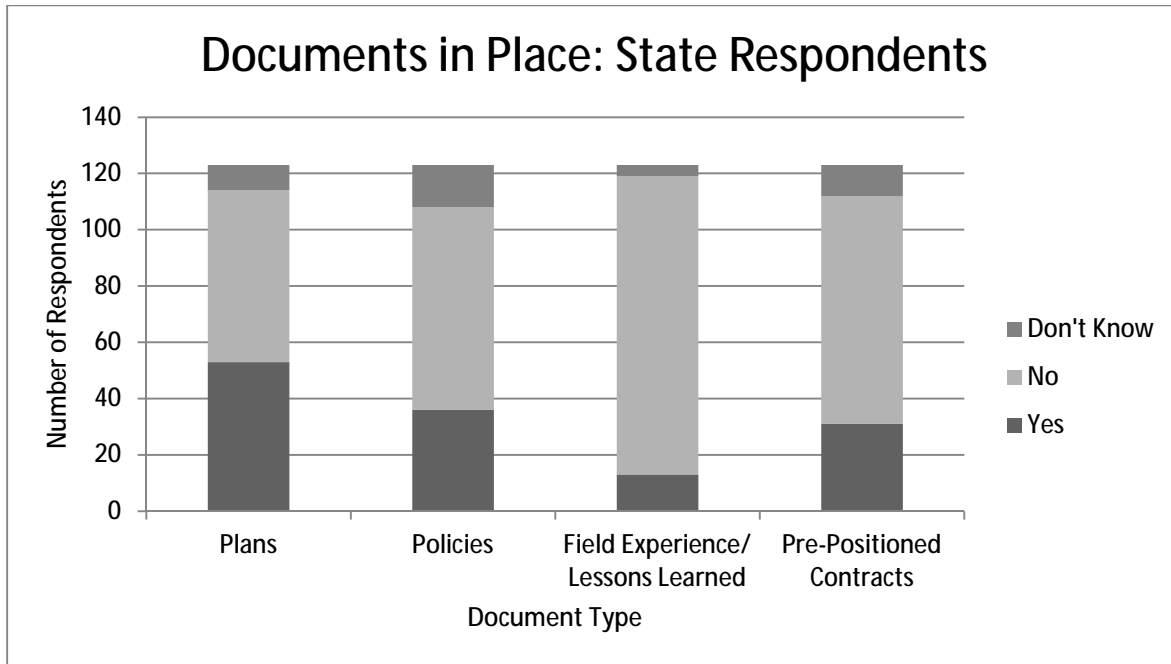


Figure 5: Documents Available to State Respondents

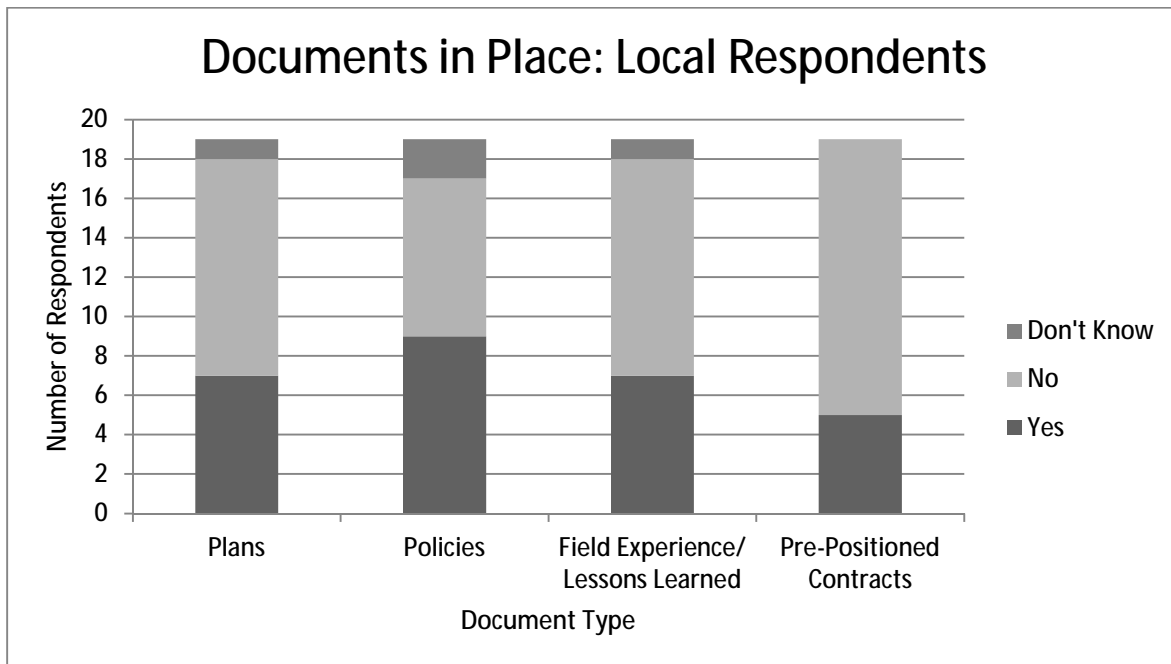


Figure 6: Documents in Place for Local Respondents

Debris Management Sites

Respondents were asked whether their organization had identified debris management sites. Figure 7 shows the distribution of responses to the question “Have you identified debris management sites?” It is notable that 31 percent of all respondents reported that their jurisdictions own their own debris management sites, and another 24 percent have identified sites and developed agreements to use them. It is also notable that nearly a quarter of respondents did not know whether their jurisdiction had identified debris management sites.

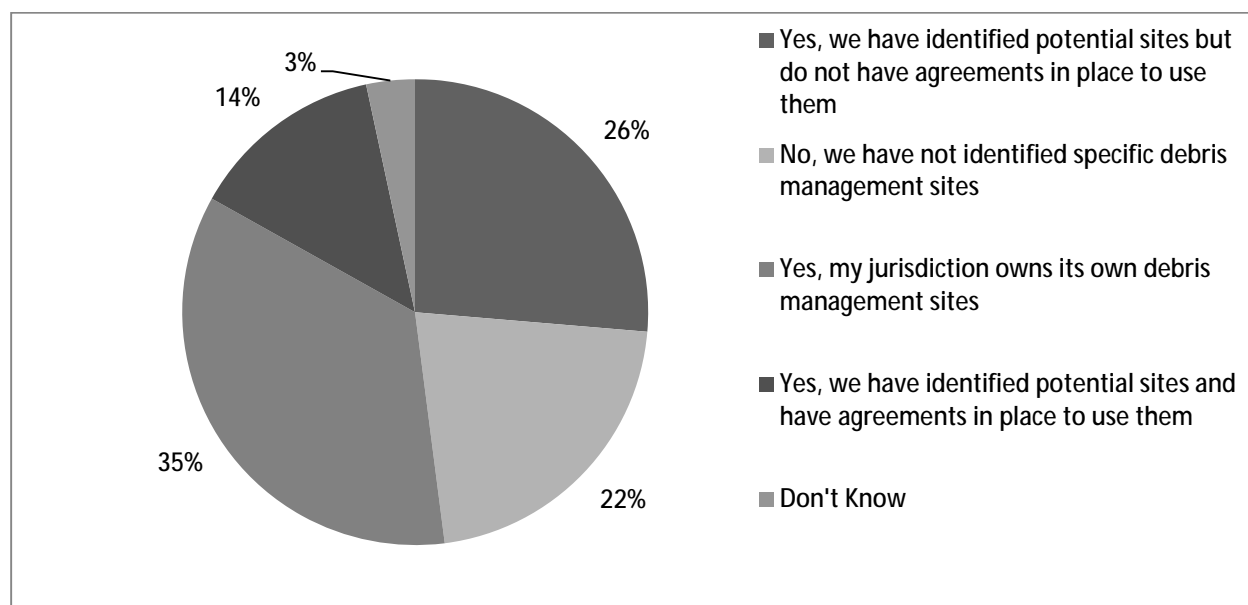


Figure 7: Debris Management Sites

Debris Management Experience

Understanding the level of debris management experience was a key goal of the field survey. Respondents were first asked to identify the number of debris management events in which they have participated. Respondents were then asked to identify the specific phases of the debris management cycle in which they have experience, including the areas in which they were most confident and the areas in which they felt the most challenged.

Figure 8 shows the distribution of experience among respondents. It is notable that the vast majority of respondents (nearly 60 percent) have participated in 1-5 debris management events, whereas only 3 percent of respondents have participated in more than 10 debris management events. This may indicate a gap in debris management knowledge as an older generation retires and a younger generation takes on debris management responsibilities.

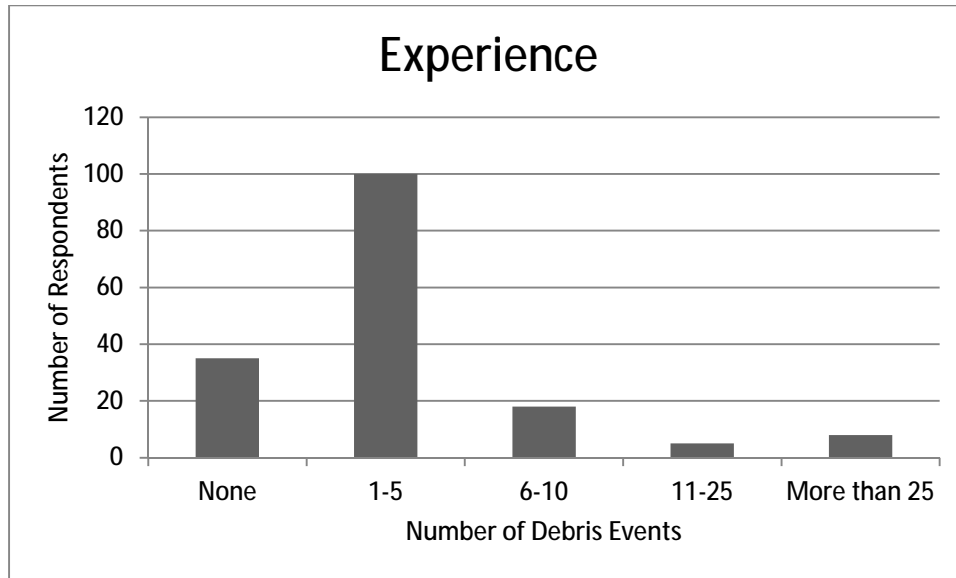


Figure 8: Level of Experience

Respondents were asked to identify the specific phases of the cycle in which they have had experience, and then to identify those phases in which they felt most confident and most challenged. Planning, removal, monitoring, and contracting were areas of highest confidence, and policy, segregation, and reimbursement were the areas in which respondents felt most challenged. Figure 9 and Figure 10 present alternate views of the same areas of experience, confidence, and challenge.

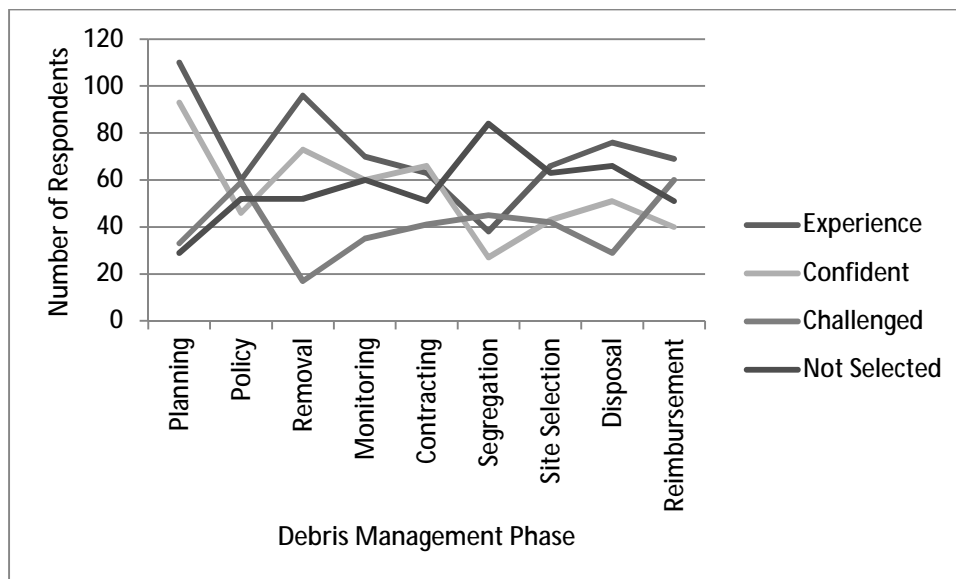


Figure 9: Debris Management Experience

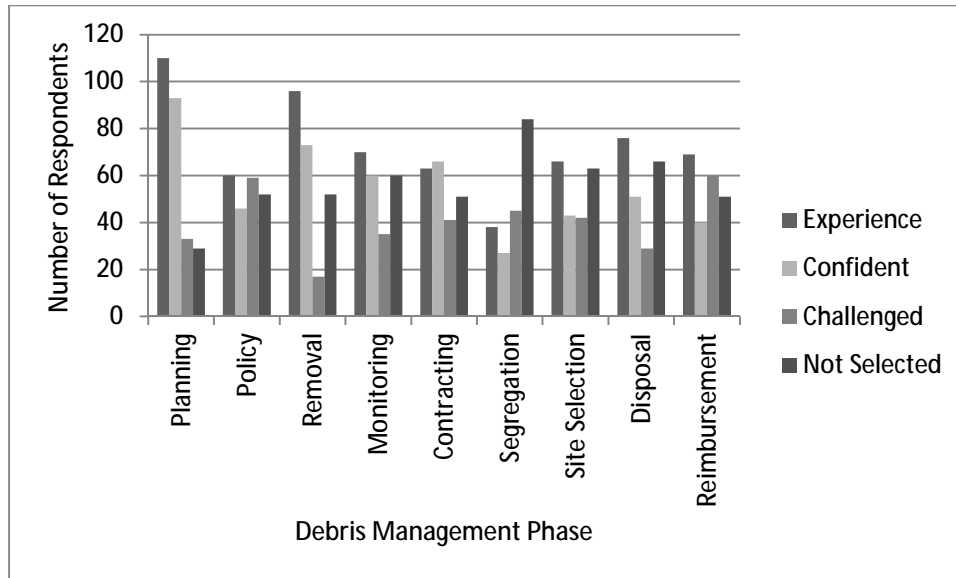


Figure 10: Debris Management Experience, Alternate View

Case Studies

Preliminary Interviews

Of the 166 respondents, 119 said they would be willing to be interviewed or might be willing to provide additional information. Of those individuals, Dewberry identified potential interview candidates from each of the 10 FEMA regions, with the goal of identifying at least two local interviewees and two State interviewees. In some regions, there were not sufficient respondents with interest. In others, there were more than 2 local or 2 State participants, and interviewees were selected based on their narrative descriptions of their field experience and geographic location.

Each of the identified interviewees was asked to participate in a 30-minute telephone interview and was asked a series of qualitative questions. The questions were designed to evoke both general thoughts on the debris management cycle and specific experiences from debris management events. A total of 21 respondents were reached and willing to participate in interviews. Notes from each interview were recorded by the interviewer and shared with the Project Team.

In-Depth Interviews

At the conclusion of the preliminary interview period, the Project Team met to discuss candidates for in-depth interviews. Of the candidates identified by the project team, three were willing to participate in in-depth interviews. Participants were asked a series of in-depth questions about their experience. The questions were designed to evoke detailed information about what worked well, what lessons were learned, and what challenges exist in the field.

These interviews were used to create three case studies focusing on experiences at the local, State, and Federal agency levels encompassing all aspects of debris management.

It is important to note that while only three in depth case studies were conducted, information we collected from the literature review, as well as the field survey, were used to identify smaller, topic specific examples to include in each chapter. These examples may have an even bigger impact on the handbook because they validate points made specific to each topic.

Additional information about the preliminary and in-depth interviews, as well as the questionnaires used for both, are included in the *Case Study Methodology Report*, included in the appendices.

Handbook Development

Our primary authors began writing the draft of the handbook based on the outline approved by the project panel. Each chapter was drafted based on the background reports developed in the first phase of the project to ensure pertinent information gathered in the previous tasks were included in each chapter. The primary authors utilized Subject Matter Experts and Case Study Liaisons as they draft each chapter to ensure information and examples were presented accurately. After the initial draft of the handbook was complete, the Principal Investigator, Subject Matter Experts and Case Study Liaisons conducted a technical review of the chapters relevant to their particular area of expertise to provide feedback and edits. Our primary authors incorporated these edits into a revised draft. During this initial review additional chapters and topic areas were identified as needing to be included and were drafted or added to the initial draft handbook.

The Task Leader, Laurel McGinley, coordinated the development of the handbook to ensure that the writers met the production schedule. She also conducted a quality review of the overall draft document to ensure that it met the contract requirements and presents a comprehensive approach to debris management that is easy to understand and follow. Upon completion of her review, she gave the document to a technical writer, who conducted a technical edit of the document, including formatting.

As the initial draft chapters were developed, the project team analyzed the detailed outline to identify where graphics might be used appropriately to convey information in an effective manner. They worked with our graphics personnel to develop appropriate flow charts, representations, photographs, tables, charts, and other visual aids that are relevant and assist the reader to understand and utilize the information presented in the handbook.

The reviewed, edited, formatted draft was then given to the Principal Investigator to conduct a final review. The final draft handbook was then formatted into a camera-ready Microsoft Word document for review by the panel.

Chapter 4: Conclusions and Ideas for Future Research and Development

The existing body of literature (as well as the additional documents suggested by the panel) served as an excellent starting point for a draft handbook. The field survey and case studies helped to focus the handbook development on real-world examples and areas in which local and State debris managers feel most challenged (especially policy, segregation, and reimbursement). The team was able to draw the best from existing publications and tools and identified new ways to present information to try to improve the understanding of lessons learned and best practices associated with those phases.

The conclusions of this research project are best represented in the *Debris Management Handbook for State and Local Departments of Transportation* and the accompanying tools.

The research efforts have also identified several areas for future research and development:

1. **Comprehensive Planning Guide for State and Local Departments of Transportation.** This would build on the planning chapter of the *Debris Management Handbook*, going into explicit details about the plans and processes necessary for a successful and actionable debris management plan. Potential topics include: Stakeholder involvement, development of contracts and memoranda of understanding, resource planning, site selection, and others.
2. **Tools and training for use of technology.** In the past decade, significant advances have been made in aerial imagery, remote sensing, and data management. This effort would create training and tools to help local and State debris managers take advantage of new technologies, including but not limited to load ticket tracking systems, debris volume modeling, remote volume assessments, and predictive cost estimating.
3. **Field Applications.** As a field tool, it may be worthwhile to develop mobile downloadable forms or apps of some of the appendices in the handbook for field use. These could be developed for use on iPhones, iPads, Android phones, tablets, etc... and could be developed to integrate with standard applications such as Excel or Access for data and documentation tracking.
4. **Debris removal activities at general aviation airports.** While the FAA regulates foreign object debris (FOD) programs at general aviation airports, there may be a gap in coordination between the FOD programs and other Federal agency disaster debris reimbursement programs that can lead to confusion regarding which agency's policies apply to local and State authorities that remove disaster debris from airport facilities. Facilitating discussions and establishing agreements between these agencies may be one way that could help clarify which policies apply to debris removal operations at general aviation airports.

Implementation Plan

Product

Natural and man-made disasters can produce large volumes of debris. The types, magnitudes, and consequences of debris can significantly impact roads, highways, and bridges in disaster-affected areas. Debris can cause damages to bridges, overpasses, culverts, and stormwater management systems, resulting in structural damages and/or widespread flooding. The Debris Management Handbook should:

1. Be the **Go-to resource** for state and local agencies to develop policies, plans, and operational procedures, including reimbursements, in matters related to Debris.
2. Be a **simple, easy** to read document that outlines a comprehensive debris management framework based on analysis of academic and applied research from national and international sources.
3. **Exemplify national best-practices** on debris management for state and local agencies to develop insights into the implicit issues and challenges that could affect the best-laid out plans and help develop adequate mitigation strategies.
4. Lay the foundation for development of **comprehensive and coordinated debris management strategy** that will enhance cooperation and participation between state and local stakeholders.

Target Audience

The objective of this research was to develop a concise, easily readable handbook of best practices and tools that state and local DOTs and public works departments can use to incorporate strategies and tactics for a wide range of debris conditions. The handbook is applicable to a wide variety of users that routinely encounter debris clearance, control or removal issues. It is also attractive to academic research bodies like the National Academies of Science (NAS), and more specifically TRB, to conduct further research on specific areas outlined in the handbook. The handbook serves to identify best practices to ensure maximum reimbursement from federal agencies associated with debris operations.

Publicize

In order to make this target audience aware of the new handbook we suggest sending out a blast email to all members of the various organizations that supported the handbook development. We also suggest posting a notice on the NCHRP website, and consider using social media such as Twitter and Facebook.

Application

Debris issues are varied, widespread, costly, and they have an immediacy to them that requires quick decision making in order to provide access to critical facilities, provide access for emergency vehicles and rescue operations. After the initial response period, debris removal and disposal often constitutes the single most costly activity faced by local and state jurisdictions. The FEMA rules, regulations and policies associated with debris may be interpreted as complex by stakeholders. Further, the FEMA regulations for debris removal differ

from the FHWA regulations in their intent, authority, timing and purpose. Together, these two different sets of guidelines may complicate the understanding of best practices for debris operations, as well as the best practices for managing the reimbursement process associated with debris activities. Having a handbook of best practices could benefit local Public Works agencies, highway departments, facilities managers that are responsible for stormwater systems, state DOTs and FEMA personnel. This handbook may serve as a resource for preplanning to help direct documentation and administrative policies, training and exercises, a field guide to help direct debris operations and minimize impacts, and an accounting reminder to supervisors and administrative staff on the requirements of debris documentation for reimbursement. It may also encourage cooperation and partnerships between different state and local agencies.

Implementation

The distribution of the Debris Management Handbook should be facilitated by short-course training, approximately four hours long and could be done over the course of several shorter modules. The highest and best delivery system is anticipated to be at successive APWA, AASHTO and SWANA conferences as well as conferences dedicated to Emergency Management such as the National Emergency Management Association's (NEMA's) annual and mid-year conferences and the International Association of Emergency Manager's annual conference. Further, the training course could be made available for on-site delivery to allow jurisdictions to minimize their travel expenses. Finally, an on-line version of the course could be developed to allow jurisdictions to hold in-house training and refresher courses with minimal costs, especially prior to natural disaster seasons. The handbook would also be made available through normal on-line access through the TRB and NCHRP web portals.

Impediments

The target audience may be resistant to using this tool given the experiences they have had with similar tools. Dewberry's approach of using an on-line survey tool and directly using testimonials to populate the handbook with case study examples has served as an outreach mechanism to not only inform the potential users of the handbook, but also allow them to feel some ownership of the document. The development of the handbook is comprehensive and applicable based on our experience in developing, collaborating and implementing handbooks for other local, state and federal clients.

Judging Progress

A tally of the number of courses delivered, number of attendees, geographic dispersion of delivery, types of agencies, number of handbooks requested, number of web-hits registered, and number of reprints can all be kept to measure the usefulness and acceptance level of the handbook. We also advocate the addition of an on-line evaluation and feedback system that would allow interested users to critique the document, comment on its accuracy and usability, and provide insights and suggestions for improvements. This could be accomplished on the NCHRP website or some other web-based portal where the users are anticipated to be located. This would serve not only as a means of continuous improvement of the 'Best Practices' but would also serve as another gauge of the interest level in the document.

Appendices

1. Annotated Bibliography
2. Literature Review Methodology Report
3. Field Survey Analysis Report
4. Case Study Methodology Report
5. Background Report: Planning
6. Background Report: Policy
7. Background Report: Contracting
8. Background Report: Removal
9. Background Report: Segregation
10. Background Report: Site Selection
11. Background Report: Monitoring
12. Background Report: Disposal
13. Background Report: Reimbursement

TRB DEBRIS MANAGEMENT HANDBOOK

ANNOTATED BIBLIOGRAPHY

JULY 19, 2012

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INTRODUCTION

This annotated bibliography compiles information gathered from over 160 publications and plans reviewed between February and July of 2012. It is the result of the Literature Review Task and serves as the deliverable for Task 1. This document is intended to serve as a quick reference for Handbook users looking for additional information.

A description of the methodology used to conduct the Literature Review is presented in the *Literature Review Methodology Report*. Detailed information about each publication is available in the *Literature Review Database*.

Publications are classified by publication type and presented alphabetically. For each publication with the exception of plans, a citation and a summary of the audiences, hazards, debris types, phases, and topics discussed in each publication are presented. Only the citations of plans are presented for confidentiality reasons.

ANNOTATED BIBLIOGRAPHY

BULLETINS

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Austin, William K. Insurance Property Valuation and Loss Settlement Clauses--Important Considerations. International Risk Management Institute. July 2008. http://www.irmi.com/expert/articles/2008/austin07-commercial-property-insurance.aspx	Insurance agents	All Hazards	All Debris	Reimbursement	Costs
Discus, Howard. Next generation gasification technology proposed for Oahu refuse crisis. Pacific Business News. 6 October 2004. http://www.bizjournals.com/pacific/stories/2004/10/04/daily55.html?page=all	State DOT and DPW Officials; Local DOT and DPW Officials; Field Staff; Debris Removal Contractors	All Hazards	Garbage; All Debris	Disposal	Reduction/recycling methods; Field experience/case studies
Environmental Protection Agency. Construction and Demolition Debris. 20 July 2006. http://www.epa.gov/region5/waste/solidwaste/debris/pdfs/cnd-reuse-recycling-presentation-200607.pdf	Debris Removal Contractors; General Public	All Hazards	C&D	Disposal; Recycling	Reduction/recycling methods; Field experience/case studies
Environmental Protection Agency. Trash and Debris Management. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=5&minmeasure=1	General Public	All Hazards	Garbage	Removal	Clearing and collection; Debris removal from waterways
International Risk Management Institute. IRMI Update #29. 12 November 2001. http://www.irmi.com/newsletters/irmiupdates/2001/0029.aspx	Insurance agents	All Hazards	All Debris	Insurance claims	Public Information
Oklahoma Department of Environmental Quality. Air, Land and Water: Guidelines for Debris Management Fact Sheet. 3 February 2010. http://www.deq.state.ok.us/factsheets/local/debris.pdf	State or Local Agency Staff	All Hazards	Vegetative; All Debris	Disposal; Removal; Segregation; Temporary Sites; Reimbursement	Debris Management Sites; Reduction/recycling methods
Thibodeau, Patrick. Handling E-Waste: The challenges of computer disposal. Computerworld. 19 November 2002. http://www.computerworld.com/s/article/75937/Handling_E_Waste	State or Local Emergency Management; State/Local Agency Staff; Field Staff; Debris Removal Contractors; General Public	Other	E-waste	Disposal	Reduction/recycling methods
United States Army Corps of Engineers. Remembering September 11th. Engineering Update. Vol 35 No 8. 11 September 2011.	Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors	Manmade	C&D	Removal; Monitoring; Segregation; Disposal	Forecasting; Clearing and collection; Debris Management Sites; Monitoring Debris Removal

FIELD GUIDES

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Australia Department of Public Works. Mitigating the Impact of Natural Disasters on Government Buildings, 1st ed. August 2011. http://www.works.qld.gov.au/downloads/bpu/samf_mind.pdf	State DPW Officials; Local DPW Officials; State/Local Agency Staff	All Hazards	All Debris	Planning	Field experience/case studies
Castillo, Carlos J. Debris Operations Clarification, Recovery Policy 9580.4. Federal Emergency Management Agency. 23 October 2008. http://www.fema.gov/government/grant/pa/9580_4.shtm	State/Local Agency Staff; Debris Monitoring Contractors	All Hazards	All Debris	Contracting	Contracted Services
Castillo, Carlos J. Duplication of Benefits, Recovery Policy 9525.3. Federal Emergency Management Agency. 24 July 2007. http://www.fema.gov/pdf/government/grant/pa/9525_3.pdf	Policy Makers; State/Local Agency Staff	All Hazards	All Debris	Reimbursement	Debris Removal Eligibility
Castillo, Carlos J. Fact Sheet: Demolition of Private Structure, Recovery Policy DAP 9523.4. Federal Emergency Management Agency. 18 July 2007. http://www.fema.gov/government/grant/pa/9523_4.shtm	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff	All Hazards	Vegetative; C&D; CBRNE; Hazardous waste; HHW; White goods; Vehicles; Vessels; Putrescent debris/Infectious waste; E-waste	Policy; Removal	Debris Removal Eligibility; Private property debris removal and disposition; Debris removal from public property
Federal Emergency Management Agency. Authorities of Federal Agencies, Recovery Policy 9525.14. http://www.fema.gov/government/grant/pa/9525_14.shtm	Field Staff; Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders	All Hazards	All Debris	All Cycles	Debris Removal Eligibility; Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods; Contracted Services; Monitoring Debris Removal; Private property debris removal and disposition; Health and safety; Costs; Debris removal from public property; Debris removal from waterways; Debris monitoring eligibility; Federal government operations
Federal Emergency Management Agency. Authorities of Federal Agencies, Recovery Policy DAP 9580.202. 27 January 2007. http://www.fema.gov/pdf/government/grant/pa/9580_202fs.pdf	State DOT Officials	All Hazards	Vegetative; Hazardous waste; Soil, mud, and sand; Vessels	Policy	Debris Removal Eligibility; Roles and Responsibilities; Debris Management Sites; Costs; Debris removal from waterways; Federal government operations
Federal Emergency Management Agency. Debris Estimating Field Guide, FEMA 329. September 2010. http://www.fema.gov/pdf/government/grant/pa/fema_329_debris_estimating.pdf	State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders	All Hazards	Vegetative; C&D; Hazardous waste; HHW;	Estimating	Debris Forecasting; Debris removal from public property

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
			White goods; E-waste		
Federal Emergency Management Agency. Debris Monitor Field Guide, FEMA 587. May 2007.	Debris Monitoring Contractors; Field Staff	All Hazards	All Debris	Monitoring	Debris Removal Eligibility; Roles and Responsibilities; Health and safety
Federal Emergency Management Agency. Debris Monitor Field Pocket Guide. http://www.h-gac.com/community/waste/storm/documents/workshops/sdws_02-15-06_debris_monitoring_field_pocket_guide.pdf	Field Staff	All Hazards	All Debris	Monitoring	Debris Removal Eligibility; Roles and Responsibilities; Debris Forecasting; Debris Management Sites; Debris reduction/recycling methods; Monitoring Debris Removal; Private property debris removal and disposition; Debris removal from public property; Debris removal from waterways; Debris monitoring eligibility; Federal government operations
Federal Emergency Management Agency. Debris Monitoring Guide, FEMA 327. October 2010. http://www.fema.gov/pdf/government/grant/pa/fema_327_debris_monitoring.pdf	Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors	All Hazards	All Debris	Reimbursement; Removal; Monitoring; Contracting; Disposal	Roles and Responsibilities; Debris Management Sites; Contracted Services; Monitoring Debris Removal; Debris removal from public property; Field experience/case studies
Federal Emergency Management Agency. Debris Monitoring, Recovery Policy 2580.203. 3 May 2007. http://wyohomelandsecurity.state.wy.us/Library/DisasterInformationReportsForms/FEMAPolicies/DebrisRemovalPolicies/DebrisMonitoring.pdf	State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors	All Hazards	Vegetative; Hazardous waste; Soil, mud, and sand	Monitoring; Contracting	Debris Removal Eligibility; Roles and Responsibilities; Debris Management Sites; Contracted Services; Monitoring Debris Removal; Debris removal from public property; Federal government operations
Federal Emergency Management Agency. Debris Operations, Recovery Policy DAP 9580.4. 23 October 2008. http://wyohomelandsecurity.state.wy.us/Library/DisasterInformationReportsForms/FEMAPolicies/EmergencyWorkContracting.pdf	State or Local Agency Staff	All Hazards	All Debris	Contracting	Contracted Services
Federal Emergency Management Agency. Debris Removal, Recovery Policy 9580.201. http://www.fema.gov/pdf/government/grant/pa/9580_201.pdf	Debris Removal Contractors; Debris Monitoring Contractors	All Hazards	All Debris	Contracting; Monitoring	Contracted Services; Debris removal from public property; Debris monitoring eligibility
Federal Emergency Management Agency. Fact Sheet: Debris Removal from Private Property, Recovery Policy DAP 9523.13. 18 July 2007. http://www.fema.gov/government/grant/pa/9523_13.shtm	Local DOT and DPW Officials; State/Local Agency Staff	All Hazards	All Debris	Removal; Policy; Removal	Debris Removal Eligibility; Private property debris removal and disposition; Debris removal from public property
Federal Emergency Management Agency. Fact Sheet: Debris Removal from Waterways, Recovery Policy DAP 9523.5. 29 March 2010. http://www.fema.gov/pdf/government/grant/pa/9523_5.pdf	State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff	All Hazards	Vessels	Removal; Policy	Debris Removal Eligibility; Roles and Responsibilities; Private property debris removal and disposition; Costs; Debris removal from public property; Federal government operations
Federal Emergency Management Agency. Fact Sheet: Hazardous Stump Extraction and Removal Eligibility, Recovery Policy DAP 9523.11. 15	State DOT and DPW Officials; Local DOT and DPW Officials; State/Local Agency Staff; Field	All Hazards	Vegetative	Removal; Removal	Debris Removal Eligibility; Private property debris removal and disposition; Debris

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
May 2007. http://www.fema.gov/government/grant/pa/9523_11.shtm	Staff; Debris Removal Contractors; Homeowners/General Public				removal from public property
Federal Emergency Management Agency. FEMA Debris Removal Operations: Disaster Assistance Strategy 2007-2, Disaster Assistance Strategy 2007-2. http://ema.ohio.gov/Documents/DRB/DebrisRemovalStrategy2007-2.pdf	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors	Talks about disaster in general, but no specific hazards	Vegetative; C&D; White goods	Removal; Planning; Removal	Debris Removal Eligibility; Roles and Responsibilities; Debris Forecasting; Debris Clearing and Collection Strategy; Debris reduction/recycling methods; Contracted Services; Private property debris removal and disposition; Debris removal from public property; Federal government operations
Federal Emergency Management Agency. Field Personnel Pocket Guide for FEMA's Public Assistance Program. 2002.	Field Staff; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors	All Hazards	All Debris	Reimbursement	Debris Removal Eligibility; Roles and Responsibilities; Costs; Federal government operations
Federal Emergency Management Agency. Hazard Mitigation Field Book, FEMA B-797. May 2010. http://www.fema.gov/library/viewRecord.do?id=4271	Local DOT Officials; State DOT and DPW Officials; Local DOT and DPW Officials; State/Local Agency Staff	Flood; Manmade	All Debris	Planning	Debris Forecasting; Field experience/case studies
Federal Highway Administration. A Guide to the Federal-Aid Highway Emergency Relief Program. June 1995.	Local DOT Officials; State DOT Officials; State/Local Agency Staff	All Hazards	Agricultural Plastic	Reimbursement	Debris Removal Eligibility; Federal government operations
Kansas Department of Health and Environment. Agricultural Plastic, SW-2011-G1. Solid Waste Technical Guidance Documents. 2011. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	C&D	Disposal; Removal; Segregation	Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods
Kansas Department of Health and Environment. Construction and Demolition Wastes and Clean Rubble, SW-1994-G2. Solid Waste Technical Guidance Documents. 1994. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	C&D	Disposal; Removal; Segregation	Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods
Kansas Department of Health and Environment. Disposal of Spoiled or Contaminated Grain, SW-1998-G6. Solid Waste Technical Guidance Documents. 1998. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	Putrescent debris/Infectious waste	Disposal; Removal; Segregation	Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods
Kansas Department of Health and Environment. Disposal Options for Expired or Surplus Medications/ Pharmaceuticals, SW 07-01. Solid Waste Technical Guidance Documents. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	Putrescent debris/Infectious waste	Disposal; Removal; Segregation	Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Kansas Department of Health and Environment. Disposal Options for Large Quantities of Dead Animals, SW-2001-G1. Solid Waste Technical Guidance Documents. 2001. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	Putrescent debris/Infectious waste	Disposal; Removal; Segregation	Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods
Kansas Department of Health and Environment. Disposal Options for Small Quantities of Dead Animals, SW-1994-G1. Solid Waste Technical Guidance Documents. 1994. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	Putrescent debris/Infectious waste	Disposal; Removal; Segregation	Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods
Kansas Department of Health and Environment. Disposal Options for X-Ray Machines, SW-1998-G3. Solid Waste Technical Guidance Documents. 1998. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	Putrescent debris/Infectious waste	Disposal; Removal; Segregation	Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods
Kansas Department of Health and Environment. Distribution of Pesticides by Household Hazardous Waste Facilities, SW-2005-G3. Solid Waste Technical Guidance Documents. 2005. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	Putrescent debris/Infectious waste	Disposal; Removal; Segregation	Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods
Louisiana Department of Environmental Quality. Disaster clean-up and Debris Management. 29 September 2010. http://www.deq.louisiana.gov/portal/DIVISIONS/WastePermits/DisasterDebrisManagement.aspx	Field Staff; Debris Removal Contractors; Debris Monitoring Contractors	All Hazards	Vegetative; C&D; CBRNE; Hazardous waste; HHW; White goods; Soil, mud, and sand; Vehicles; Vessels; Putrescent debris/Infectious waste; E-waste	Planning; Removal; Monitoring; Contracting; Segregation; Temporary Sites; Disposal	Debris Removal Eligibility; Roles and Responsibilities; Debris Forecasting; Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods; Monitoring Debris Removal; Debris removal from public property; Field experience/case studies
National Oceanic and Atmospheric Administration. Marine Debris Emergency Response Planning in the North-Central Gulf of Mexico, NOS-OR&R-3. July 2009. http://marinedebris.noaa.gov/projects/pdfs/gom_mderp.pdf	State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors	Hurricane; Tornado; Flood	All Debris	Planning; Removal; Monitoring; Contracting; Segregation; Temporary	Debris Removal Eligibility; Roles and Responsibilities; Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods; Costs; Debris removal from public property; Federal government operations

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
New Hampshire Department of Environmental Science. Management of Collected Debris Following Severe Storm Events. 2011. http://des.nh.gov/organization/commissioner/pip/factsheets/co/documents/co-23.pdf	State DPW Officials; Local DPW Officials; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; Homeowners/General Public	All Hazards	All Debris; Vegetative; C&D; CBRNE; Hazardous waste; HHW; White goods; Vehicles; Vessels; Putrescent debris/Infectious waste; E-waste	Sites; Disposal Removal; Segregation	Debris Removal Eligibility; Debris Clearing and Collection Strategy; Debris reduction/recycling methods; Health and safety; Debris removal from public property; Field experience/case studies
Occupational Safety and Health Administration. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. October 1985. http://www.osha.gov/Publications/complinks/OSHG-HazWaste/all-in-one.pdf	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders	All Hazards	Hazardous waste; HHW	Monitoring; Disposal	Roles and Responsibilities; Debris Management Sites; Debris reduction/recycling methods; Monitoring Debris Removal; Health and safety; Debris removal from public property; Field experience/case studies
O'Connell, Kim. Passing the Smell Test. Waste Age. 1 April 2005. http://waste360.com/mag/waste_passing_smell_test	Local DOT and DPW Officials; Field Staff; Debris Removal Contractors	All Hazards	C&D	Disposal	Debris Management Sites; Debris reduction/recycling methods
Ohio Emergency Management Agency. Sample Debris Management Plan. October 2002. http://ema.ohio.gov/Documents/DRB/Debris_Plan.pdf	State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders	All Hazards	All Debris	Removal; Contracting; Segregation; Temporary Sites; Disposal	Debris Removal Eligibility; Roles and Responsibilities; Debris Forecasting; Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods; Contracted Services; Monitoring Debris Removal; Private property debris removal and disposition; Costs; Debris removal from public property; Debris removal from waterways; Federal government operations; Field experience/case studies
Ohio Environmental Protection Agency. Debris Fact Sheet for Local Officials. November 2011. http://ema.ohio.gov/Documents/DRB/debris_fact_sheet.pdf	Local DOT and DPW Officials; State/Local Agency Staff	All Hazards	Vegetative; C&D; CBRNE; Hazardous waste; HHW; Putrescent debris/Infectious waste; Garbage	Removal; Contracting; Segregation; Temporary Sites; Disposal; Reimbursement	Debris Removal Eligibility; Debris Management Sites; Debris reduction/recycling methods; Contracted Services; Costs; Federal government operations
Pardue, J.H. Anticipating environmental problems facing hurricane debris landfills in New Orleans East. Louisiana State University. 2006.	Policy Makers; State DOT and DPW Officials	All Hazards	C&D	Disposal; Segregation;	Debris Clearing and Collection Strategy; Debris Management Sites; Debris

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
http://www.lwrri.lsu.edu/downloads/white_paper2006/white%20paper_final.draft2.pdf				Temporary Sites	reduction/recycling methods; Health and safety; Field experience/case studies
United States Army Corps of Engineers. Debris QA Field Guide. November 2006.	Field Staff; State/Local Agency Staff; Debris Removal Contractors; Emergency responders	All Hazards	All Debris	Removal; Monitoring; Segregation	Debris Clearing and Collection Strategy; Debris Management Sites; Monitoring Debris Removal; Health and safety; Debris removal from public property; Federal government operations
Wisconsin Department of Natural Resources. Demolition Debris Guidance on the Management of Debris Resulting from Natural Disasters or Planned Demolition Activities, WA-601. September 2007. http://dnr.wi.gov/files/pdf/pubs/wa/wa601.pdf	Local DOT and DPW Officials; State/Local Agency Staff; Field Staff	All Hazards	Vegetative; C&D; Hazardous waste; HHW	Segregation; Planning; Disposal	Debris reduction/recycling methods
Wisconsin Department of Natural Resources. Rethinking Debris. The Industry: Construction And Demolition Waste Reduction And Recycling Tips. http://dnr.wi.gov/files/PDF/pubs/wa/ie211.pdf	State DOT and DPW Officials; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors	All Hazards	Vegetative; C&D; Garbage	Segregation; Disposal	Debris reduction/recycling methods; Contracted Services; Field experience/case studies
Zimmerman, Elizabeth. Fact Sheet: Debris Operation-Hand-Loaded Truck and Trailers, Recovery Policy DAP 9523.12. Federal Emergency Management Agency. 17 August 2010. http://www.fema.gov/government/grant/pa/9523_12.shtm	Local DOT and DPW Officials; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	Vegetative	Monitoring; Reimbursement	Monitoring Debris Removal; Debris removal from public property; Field experience/case studies

FIELD REPORTS

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Ardani, Kristen, C. Reith and C. Donlan. Harnessing Catastrophe to Promote Resource Recovery and Eco-industrial Development. Journal of Industrial Ecology. Vol 13 No 4. 2009. http://advancedconservation.org/library/ardani_etal_2009.pdf	Policy Makers; State DOT and DPW Officials; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors	Hurricane; All Hazards; Other; War	All Debris	Disposal	Debris Removal Eligibility; Reduction/recycling methods; Field experience/case studies
Brandon, Dennis, V. Medina and A. Morrow. A Case History Study of the Recycling Efforts from the United States Army Corps of Engineers Hurricane Katrina Debris Removal Mission in Mississippi, Article ID 526256. Advances in Civil Engineering. Vol 2011. United States Army Corps of Engineers. 15 June 2011. http://trid.trb.org/view/2011/C/1114113	Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff	Hurricane; Flood	Vegetative; C&D; White goods; Vehicles; Vessels; E-waste	Disposal; Removal; Temporary Sites	Reduction/recycling methods; Field experience/case studies
Environmental Protection Agency. EPA Provided Quality and Timely Information on Hurricane Katrina Hazardous Material Releases and Debris Management, 2006-P-00023. 2 May 2006. http://www.epa.gov/oig/reports/2006/20060502-2006-P-00023.pdf	Policy Makers; State DOT and DPW Officials; Local DOT and DPW Officials	Hurricane	Hazardous waste; All Debris	Monitoring; Segregation; Temporary Sites; Disposal	Roles and Responsibilities; Debris Management Sites; Reduction/recycling methods; Health and safety; Public Information; Federal government operations; Field experience/case studies
Esworthy, Robert. Cleanup after Hurricane Katrina: Environmental Considerations, Order Code RL33115. Congressional Research Service. 13 October 2005. http://assets.opencrs.com/rpts/RL33115_20051013.pdf	Policy Makers	Hurricane	All Debris	Removal; Disposal	Clearing and collection; Debris Management Sites; Reduction/recycling methods; Health and safety; Federal government operations; Field experience/case studies
Federal Emergency Management Agency. Debris Management: The American Samoa Joint Field Office's Formation of the Interagency Debris Management Task Force. Good Story. 13 January 2012.	Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Federal government	Other; Tsunami	Vegetative; C&D; Hazardous waste; White goods; E-waste	Removal; Segregation; Temporary Sites; Disposal	Roles and Responsibilities; Clearing and collection; Debris Management Sites; Reduction/recycling methods; Public Information; Debris removal from waterways; Federal government operations; Field experience/case studies
Federal Emergency Management Agency. The Response To The 2011 Joplin, Missouri, Tornado. 20 December 2011.	Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff	Tornado	All Debris	Reimbursement; Removal; Segregation	Debris Removal Eligibility; Private property debris removal; Public Information; Federal government operations; Field experience/case studies
Government Accountability Office. Continuing Debris Removal and Disposal Issues, GAO-08-985R. 25 August 2008. http://www.gao.gov/products/GAO-08-985R	Policy Makers	Hurricane	C&D	Removal; Temporary Sites; Disposal	Debris Removal Eligibility; Debris Management Sites; Reduction/recycling methods; Monitoring Debris Removal; Health and safety; Field experience/case studies
Greber, Jack. Management of Hazardous Wastes during EPA's Emergency Response to Hurricanes Katrina and Rita, Extended Abstract #995. Environmental Quality Management Inc. http://www.eqm.com/eq/pdf/EQ-Katrina-Response.pdf	Policy Makers	Hurricane	Hazardous Waste	Removal; Disposal	Debris Management Sites; Contracted Services; Federal government operations

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Hatfield, Jim and et al. Lessons Learned: EPA's Response to Hurricane Katrina, 2006-P-00833. Office of the Inspector General. 38974. http://www.epa.gov/oig/reports/2006/20060914-2006-P-00033.pdf	Policy Makers	Hurricane	Hazardous Waste	Monitoring	Debris Management Sites; Monitoring Debris Removal; Field experience/case studies
In Katrina's Wake. Environmental Health Perspectives. January 2006. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1332683/	Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; General Public	Hurricane	Vegetative; C&D; White goods; Putrescent/ Infectious waste; E-waste	Removal; Monitoring; Temporary Sites; Disposal	Clearing and collection; Reduction/recycling methods; Monitoring Debris Removal; Field experience/case studies
Jacobitz, Steve. Learning from Disaster. Public Roads. Vol 69 No 3. Federal Highway Administration. November 2005. http://trid.trb.org/view/2005/C/773040	State DOT Officials; Local DOT Officials	Hurricane; Flood	All Debris	Removal	Debris Removal Eligibility; Contracted Services; Field experience/case studies
Jadacki, Matt. Review of FEMA Guidance for Monitoring Debris Removal Operations for Hurricane Katrina, OIG-07-63. Office of the Inspector General. United States Department of Homeland Security. August 2007. http://www.oig.dhs.gov/assets/Mgmt/OIG_07-63_Aug07.pdf	Policy Makers; Applies to FEMA	Hurricane	All Debris	Monitoring; Contracting; Segregation	Contracted Services; Monitoring Debris Removal; Federal government operations
Luther, Linda. Disaster Debris Removal After Hurricane Katrina: Status and Associated Issues, RL 33477. Congressional Research Service. 2 April 2008.	Policy Makers	Hurricane	Vegetative; C&D; HHW; White goods; Vehicles; Putrescent/ Infectious waste; Garbage	Removal; Segregation; Temporary Sites	Debris Removal Eligibility; Clearing and collection; Debris Management Sites; Reduction/recycling methods; Private property debris removal; Costs; Federal government operations; Field experience/case studies
Manders, Damon, D. Tajkowski and M. Dace. Debris Removal Statistics And Information From Hurricane Katrina US Army Corps Of Engineers Operations. Task Force Hope. 2005.	Field Staff; Policy Makers; State or Local Emergency Management; Field Staff; Emergency responders; USACE	Hurricane	Vegetative; C&D; Hazardous waste; Vehicles; Vessels; Putrescent/ Infectious waste; Garbage	Removal; Monitoring; Contracting; Temporary Sites	Debris Removal Eligibility; Roles and Responsibilities; Clearing and collection; Debris Management Sites; Reduction/recycling methods; Contracted Services; Monitoring Debris Removal; Private property debris removal; Health and safety; Costs; Debris removal from waterways; Federal government operations; Field experience/case studies
National Oceanic and Atmospheric Administration. Interagency Report On Marine Debris Sources, Impacts, Strategies & Recommendations. August 2008. http://marinedebris.noaa.gov/about/pdfs/imdcreport.pdf	Policy Makers	All Hazards	Marine	Planning; Removal; Sources and prevention of marine debris	Roles and Responsibilities; Forecasting; Debris Management Sites; Federal government operations
New Jersey Board of Public Utilities. Hurricane Irene Electric Response Report. December 2011.	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff	Hurricane	Vegetative	Removal	Roles and Responsibilities; Clearing and collection; Field experience/case studies

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Office of the Inspector General. United States Department of Homeland Security. Performance Review of FEMA's Disaster Management Activities in Response to Hurricane Katrina. 1 March 2006. http://www.oig.dhs.gov/assets/mgmt/oig_06-32_mar06.pdf	Policy Makers; State/Local Agency Staff	Hurricane	All Debris	All Cycles	Debris Removal Eligibility; Federal government operations
Polown, Carlotte, M. Milke and E. Seville. Disaster Waste Management Following the 2009 Victorian bushfires. Australian Journal of Emergency Management. Vol 26 No 2. April 2011.	Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff	Wildfire	All Debris	Planning; Contracting; Segregation; Temporary Sites; Reimbursement	Debris Removal Eligibility; Roles and Responsibilities; Clearing and collection; Debris Management Sites; Contracted Services; Costs; Federal government operations; Field experience/case studies
Recovery Management Incorporated. Joplin Debris Scanning Results.	Debris Removal Contractors; Field Staff; Debris Monitoring Contractors	Tornado	All Debris	Monitoring	Monitoring Debris Removal; Field experience/case studies
Shedden, Rick, G. Evett and T. Flanagan. Monterey Regional Waste Management District-Katrina Response Waste Processing Priorities. Monterey Regional Waste. 15 September 2005. http://www.swana.org/pdf/swana_pdf_358.pdf	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff	Hurricane	C&D; Hazardous waste; HHW; White goods; Vehicles; Putrescent/ Infectious waste; E-waste	Temporary sites	Clearing and collection; Debris Management Sites; Reduction/recycling methods; Health and safety; Field experience/case studies
Solid Waste Association of North America. Hurricane Katrina Disaster Debris Management: Lessons Learned from State and Local Governments. 21 September 2005. http://www.swana.org/pdf/swana_pdf_358.pdf	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff	Hurricane	C&D; Hazardous waste; HHW; Vehicles; E-waste	Planning; Removal	Clearing and collection; Field experience/case studies
State of Hawaii. Hawaii Disaster Debris Management Plan Best Management Practices Annex. 2005. http://www.swana.org/pdf/swana_pdf_358.pdf	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff	Hurricane; All Hazards	Vegetative; C&D; Hazardous waste; HHW; White goods; Putrescent/ Infectious waste; Fuel tanks	Removal; Segregation; Disposal	Debris Management Sites; Health and safety; Public Information; Costs; Field experience/case studies
Texas Commission on Environmental Quality. Managing storm debris from Hurricane Rita. 29 September 2005. http://texashelp.tamu.edu/005-agriculture/pdf/Managing-Storm-Debris-from-Hurricanes.pdf	State or Local Emergency Management; State/Local Agency Staff; Field Staff; Emergency responders	Hurricane; Thunderstorm	Vegetative; C&D; Hazardous waste; HHW; White goods; Vessels;	Disposal; Segregation	Debris Removal Eligibility; Debris Management Sites; Reduction/recycling methods; Health and safety; Public Information

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
			Putrescent/ Infectious waste; E-waste		
Transportation Research Board. National Cooperative Highway Research Program. Planning For A New Type Of Natural Disaster: El Nino Phenomenon Brings Innovative Approaches. Vol 62 No 1. July 1998. http://trid.trb.org/view/1998/C/539809	State DOT Officials; Local DOT Officials	Hurricane; Flood	All Debris	Planning	Field experience/case studies
United Nations Development Programme. Fact Sheet: Haiti Earthquake Debris Management. http://www.haiti.prizm.org/Debris%20fact%20sheet%202010%20June%20UNDP.pdf	Field Staff	Hurricane; Flood; Earthquake; Manmade	All Debris	Removal; Disposal	Debris Management Sites; Reduction/recycling methods; Monitoring Debris Removal; Costs; Field experience/case studies
United States Army Corps of Engineers. Debris Management Lessons Learned. http://www.newmoa.org/solidwaste/cwm/disdeb/ACEKATRINAVersion4.pdf	State DOT and DPW Officials; State or Local Emergency Management; State/Local Agency Staff; Federal government	Hurricane	C&D; HHW; White goods; Soil, mud, and sand; Vehicles; Vessels; E-waste	Planning; Contracting; Segregation; Temporary Sites; Disposal	Debris Removal Eligibility; Forecasting; Clearing and collection; Debris Management Sites; Reduction/recycling methods; Health and safety; Federal government operations; Field experience/case studies
United States Army Corps of Engineers. Engineer Update: Recovery in Joplin. Engineering Update. Vol 35 No 7. November 2011.	Policy Makers; State DOT and DPW Officials; Local DOT and DPW Officials; Emergency responders; General Public	Tornado	Vegetative; C&D	Removal; Segregation	Reduction/recycling methods; Private property debris removal; Debris removal from waterways; Field experience/case studies
United States Navy. U.S. Navy Salvage Report, S0800-AC-RPT-010. January 2007.	Policy Makers	Hurricane	Marine	Removal; Reimbursement	Debris Removal Eligibility; Roles and Responsibilities; Clearing and collection; Health and safety; Costs; Debris removal from waterways; Federal government operations; Field experience/case studies

HANDBOOKS

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Federal Emergency Management Agency. Debris Management Guide, FEMA 325. July 2007.	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders	All Hazards	All Debris	All Cycles	Debris Removal Eligibility; Roles and Responsibilities; Debris Forecasting; Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods; Contracted Services; Monitoring Debris Removal; Private property debris removal and disposition; Health and safety; Public Information; Costs; Debris removal from public property; Federal government operations
Federal Emergency Management Agency. Debris Management Plan Workshop, FEMA P604. September 2009. http://www.fema.gov/pdf/government/grant/pa/dmpw_handbook.pdf	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; All Hazards	All Debris	All Phases	Debris Removal Eligibility; Roles and Responsibilities; Debris Forecasting; Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods; Contracted Services; Monitoring Debris Removal; Private property debris removal and disposition; Health and safety; Public Information; Costs; Debris removal from public property; Field experience/case studies
Federal Highway Administration. Emergency Relief Manual. November 2009. http://www.fhwa.dot.gov/reports/erm/	State DOT Officials; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials	All Hazards	Vegetative; Soil, mud, and sand; Vehicles; Vessels; Garbage; Snow	Removal	Debris Removal Eligibility; Roles and Responsibilities; Debris Management Sites; Costs; Debris removal from public property; Federal government operations
Kansas Department of Health and Environment. Characteristic and Listed Hazardous Wastes, HW-2011-G2. Hazardous Waste Technical Guidance Documents. 2011. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	Hazardous waste	Segregation; Classification of hazardous waste	Hazardous waste classification
Kansas Department of Health and Environment. Container Management for Hazardous Waste Generators, HW-2005-G1. Hazardous Waste Technical Guidance Documents. 2005. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake;	Hazardous waste	Temporary Sites; Storage of hazardous waste	Debris Management Sites; Debris reduction/recycling methods

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Kansas Department of Health and Environment. Disposal of Damaged, Unused, or Unexploded Consumer Fireworks, HW-2009-G1. Hazardous Waste Technical Guidance Documents. 2009. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Wildfire; Snow Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	Hazardous waste	Disposal	Debris Clearing and Collection Strategy; Debris reduction/recycling methods; Health and safety
Kansas Department of Health and Environment. Establishing Waste Reduction Schedules in Solid Waste Management Plans, SW 06-01. Solid Waste Technical Guidance Documents. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	All Debris	Planning	Debris Clearing and Collection Strategy; Debris Management Sites
Kansas Department of Health and Environment. Fire Control and Extinguishing Procedures at Permitted Construction and Demolition Landfills, SW 05-04. Solid Waste Technical Guidance Documents. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	C&D	Temporary Sites	Debris Management Sites
Kansas Department of Health and Environment. Hazardous Waste Determinations and Documentation, HW-2011-G1. Hazardous Waste Technical Guidance Documents. 2011. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	Hazardous waste	Segregation	Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods
Kansas Department of Health and Environment. HHW Management at Municipal Solid Waste Landfills and Transfer Stations, SW 04-01. Solid Waste Technical Guidance Documents. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	HHW	Temporary Sites; Segregation; Disposal	Debris Management Sites
Kansas Department of Health and Environment. Household Medication Collection by Pharmacies, SW-2012-G1. Solid Waste Technical Guidance Documents. 2012. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	HHW; Hazardous waste; Putrescent debris/Infectious waste	Removal; Disposal	Debris Clearing and Collection Strategy; Health and safety; Public Information
Kansas Department of Health and Environment. Management of Used Antifreeze, HW-1997-G2. Hazardous Waste Technical Guidance	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and	Hurricane; Tornado;	HHW	Disposal	Debris Clearing and Collection Strategy; Debris reduction/recycling methods; Health

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Documents. 1997. http://www.kdheks.gov/waste/p_techguides.html	DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow			and safety
Kansas Department of Health and Environment. Management Requirements for Specified Risk Material, SW-2005-G2. Solid Waste Technical Guidance Documents. 2005. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	Putrescent debris/Infectious waste	Disposal	Debris Clearing and Collection Strategy; Debris reduction/recycling methods; Health and safety
Kansas Department of Health and Environment. Medical Services Waste, SW 00-01. Solid Waste Technical Guidance Documents. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	Putrescent debris/Infectious waste; CBRNE; Hazardous waste	Disposal; Removal; Temporary Sites	Debris Clearing and Collection Strategy; Debris reduction/recycling methods
Kansas Department of Health and Environment. Minimization and Disposal of Transfer Station Washdown Wastewater, SW-1998-G2. Solid Waste Technical Guidance Documents. 1998. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	Hazardous waste	Disposal; Removal; Temporary Sites	Debris Clearing and Collection Strategy; Debris reduction/recycling methods
Kansas Department of Health and Environment. Mud Trap Wastes, SW-1994-G3. Solid Waste Technical Guidance Documents. 1994. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	All Hazards	Soil, mud, and sand	Disposal; Removal; Segregation	Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods
Kansas Department of Health and Environment. Natural Disaster Debris, SW-2009-G2. Solid Waste Technical Guidance Documents. 2009. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	All Debris	Temporary Sites; Disposal	Roles and Responsibilities; Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods
Kansas Department of Health and Environment. Petroleum Product Mixed with Water, HW-1997-G1. Hazardous Waste Technical Guidance Documents. 1997. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders;	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood;	HHW; Aerosol ca	Disposal	Debris Clearing and Collection Strategy; Debris reduction/recycling methods; Health and safety

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
	Homeowners/General Public	Earthquake; Wildfire; Snow			
Kansas Department of Health and Environment. Recycling and Disposal of Aerosol Cans, HW-2002-G2. Hazardous Waste Technical Guidance Documents. 2002. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	HHW; Universal Waste	Disposal	Debris Clearing and Collection Strategy; Debris reduction/recycling methods; Health and safety
Kansas Department of Health and Environment. Requirements for Handlers of Universal Waste, HW-2001-G1. Hazardous Waste Technical Guidance Documents. 2001. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	Hazardous waste	Handling	Debris reduction/recycling methods; Health and safety
Kansas Department of Health and Environment. Sampling Analysis Plan Development for Industrial Landfills, SW 03-01. Solid Waste Technical Guidance Documents. 2001. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	Garbage	Temporary Sites	Debris Management Sites
Kansas Department of Health and Environment. Sampling Analysis Plan Development for Municipal Solid Waste Landfills, SW-1996-G2. Solid Waste Technical Guidance Documents. 1996. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	Garbage	Temporary Sites	Debris Management Sites
Kansas Department of Health and Environment. Sampling Analysis Plan for Small Arid Landfills, SW-1997-G3. Solid Waste Technical Guidance Documents. 1997. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	Garbage	Temporary Sites	Debris Management Sites

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Kansas Department of Health and Environment. Spent Fluorescent Lamps Containing Mercury, HW-1995-G1. Hazardous Waste Technical Guidance Documents. 1995. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	HHW	Disposal	Debris Clearing and Collection Strategy; Debris reduction/recycling methods; Health and safety
Kansas Department of Health and Environment. Tree and Brush Mulch Processing and Storage Areas, SW-2008-G3. Solid Waste Technical Guidance Documents. 2008. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	Vegetative	Temporary Sites	Debris Management Sites
Kansas Department of Health and Environment. Used Oil Burning and Fuel Specifications, HW-1998-G2. Hazardous Waste Technical Guidance Documents. 1998. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	HHW	Disposal	Debris reduction/recycling methods
Kansas Department of Health and Environment. Used Oil Collection Centers and Aggregation Points, HW-2000-G1. Hazardous Waste Technical Guidance Documents. 2000. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	HHW	Temporary Sites	Debris Clearing and Collection Strategy; Debris Management Sites
Kansas Department of Health and Environment. Waste Screening and General Operations at Construction and Demolition Landfills, SW-2002-G1. Solid Waste Technical Guidance Documents. 2002. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	C&D	Temporary Sites	Debris Management Sites; Debris reduction/recycling methods
Kansas Department of Health and Environment. Wastes Containing Lead-Based Paint, SW-2010-G1. Solid Waste Technical Guidance Documents. 2010. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake;	Hazardous waste	Disposal	Debris reduction/recycling methods; Health and safety

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
		Wildfire; Snow			
Kansas Department of Health and Environment. White Goods Storage, Recycling, and Disposal, SW-1995-G2. Solid Waste Technical Guidance Documents. 1995. http://www.kdheks.gov/waste/p_techguides.html	Field Staff; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Hurricane; Tornado; Thunderstorm; Ice Storm; Flood; Earthquake; Wildfire; Snow	White goods	Disposal; Temporary Sites; Recycling	Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods
Michigan State Police. Local Disaster Debris Management Planning Handbook, 109a. April 2008. http://www.michigan.gov/documents/msp/Local_Disaster_Debris_Mgmt_Planning_Handbook_2008_359456_7.pdf	Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; Homeowners/General Public	Tornado; Ice Storm; Flood; Wildfire; Manmade	All Debris	Removal; Monitoring; Segregation; Disposal	Debris Removal Eligibility; Roles and Responsibilities; Debris Forecasting; Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods; Contracted Services; Monitoring Debris Removal; Private property debris removal and disposition; Costs; Debris removal from public property; Federal government operations
O'Brien, Audrey. Managing and Permitting Disaster Debris. Oregon Department of Environmental Quality. September 2011. http://www.deq.state.or.us/lq/pubs/docs/sw/ManagingPermittingDisasterDebris.pdf	State/Local Agency Staff; Field Staff; Emergency responders	All Hazards	C&D; CBRNE; Hazardous waste; HHW; White goods; Vehicles; Vessels; Putrescent debris/Infectious waste; Garbage; E-waste	Disposal; Temporary Sites; Disposal	Roles and Responsibilities; Debris Forecasting; Debris Management Sites; Debris reduction/recycling methods; Private property debris removal and disposition; Costs; Debris removal from public property; Federal government operations
Reinhart, Debra R and Philip T. McCreanor. Disaster Debris Management-Planning Tools. Environmental Protection Agency. Region IV. 24 September 1999. http://www.cece.ucf.edu/people/reinhart/research/DDfinalreport.pdf	State DOT and DPW Officials; Local DOT and DPW Officials; State/Local Agency Staff	Hurricane; Tornado; Flood; Earthquake; Wildfire; All Hazards	C&D; Hazardous waste; HHW	Disposal; Recycling	Debris Clearing and Collection Strategy; Debris reduction/recycling methods; Federal government operations; Field experience/case studies
Solis, Gabriela Y, Henry C. Hightower, Jim Sussex, and June Kawaguchi. Disaster debris management. The Disaster Preparedness Resources Center, University of British Columbia, Center for Emergency Preparedness. 1995. http://publications.gc.ca/collections/Collection/D82-51-1999E.pdf	State or Local Agency Staff; Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; Emergency responders	All Hazards	All Debris	Removal; Monitoring; Segregation; Temporary Sites; Disposal	Roles and Responsibilities; Debris Clearing and Collection Strategy; Debris Management Sites; Debris reduction/recycling methods

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
United States Army. Disaster Response Staff Officer's Handbook. 1 December 2005. <a debris"="" href="http://usacac.army.mil/cac2/call/docs/11-07/11-07.pdf#search=">http://usacac.army.mil/cac2/call/docs/11-07/11-07.pdf#search="debris"	Emergency responders; Army personnel	All Hazards	All Debris	Response	Roles and Responsibilities; Health and safety
United States Coast Guard. NPFC Mission Overview. 30 June 2005. http://www.uscg.mil/npfc/docs/PDFs/Reports/Mission_Overview_2008.pdf	State or Local Agency Staff	Other; Oil spills	Hazardous waste	Policy; Removal; Reimbursement	Debris Removal Eligibility; Debris removal from waterways; Federal government operations

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Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
California Emergency Management Agency. Disaster Debris Management Training Manual. September 2011. http://www.calema.ca.gov/Recovery/Pages/Debris-Management.aspx	State or Local Emergency Management; State/Local Agency Staff	All Hazards	Vegetative; C&D; Hazardous waste; HHW	Removal	Debris Removal Eligibility; Roles and Responsibilities; Private property debris removal; Debris removal from public property; Federal government operations
California Office of Emergency Services. Debris Management in Disaster Recovery. January 2005. http://www.stopwaste.org/docs/disaster_debris_management_training_manual.pdf	State/Local Agency Staff; Field Staff; Debris Removal Contractors	Hurricane; Tornado; Ice Storm; Flood; Earthquake; Wildfire; Manmade	Vegetative; C&D; HHW; White goods; Vehicles; E-waste	Planning; Monitoring; Contracting; Temporary Sites; Reimbursement	Debris Removal Eligibility; Forecasting; Clearing and collection; Reduction/recycling methods; Contracted Services; Monitoring Debris Removal; Private property debris removal; Costs; Debris removal from public property; Federal government operations
Channel, Mark, M. Graves, V. Medina, A. Morrow, D. Brandon and C. Nestler. Enhanced Tools and Techniques to Support Debris Management in Disaster Response Missions, ERDC/EL TR-09-12. Environmental Lab. Engineer Research and Development Center. United States Army Corps of Engineers. May 2009. http://www.dtic.mil/dtic/tr/fulltext/u2/a508559.pdf	Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors	Flood; All Hazards	Vegetative; C&D; CBRNE; Hazardous waste; HHW; White goods; Soil, mud, and sand; Vehicles; Vessels; Putrescent/ Infectious waste; E-waste	Planning; Removal; Segregation	Forecasting; Clearing and collection; Debris Management Sites; Health and safety; Debris removal from public property
Federal Emergency Management Agency. Expedited Debris Removal Initiative. http://www.fema.gov/pdf/media/factsheets/2011/expedited_debris_removal.pdf	Policy Makers; State or Local Emergency Management; State/Local Agency Staff	All Hazards	All Debris	Policy; Removal; Contracting	Debris Removal Eligibility; Forecasting; Private property debris removal; Debris removal from public property
Federal Emergency Management Agency. FEMA Debris Management Fact Sheets (FS) – Series 9500; Debris Operations – Clarification: Emergency Contracting vs. Emergency Work, 9580.4. 23 October 2008. http://wyohomelandsecurity.state.wy.us/Library/DisasterInformationReportsForms/FEMAPolicies/EmergencyWorkContracting.pdf	State or Local Agency Staff	All Hazards	All Debris	Contracting	Contracted Services
Federal Emergency Management Agency. National Mutual Aid and Resource Management Initiative Glossary of Terms and Definitions. December 2003. http://www.scd.hawaii.gov/NIMS/glossaryterms.pdf	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders	All Hazards	All Debris		Roles and Responsibilities

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Federal Emergency Management Agency. Resources for Debris Removal and Operation. March 2008. http://kyem.ky.gov/currentdisasters/Documents/Debris%20Removal%20from%20Private%20Property%20Overview%203%201%202008.pdf	State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors	All Hazards	Vegetative; C&D; White goods; Soil, mud, and sand; Vehicles; E-waste	Removal	Debris Removal Eligibility; Clearing and collection; Private property debris removal; Debris removal from public property; Field experience/case studies
Georgia Emergency Management Agency. Debris Removal Quick Guide. http://www.gema.ga.gov/content/atts/PA%20Website/20110509%20GA%20Debris%20Quick%20Guide.pdf	Field Staff; State DOT and DPW Officials; Local DOT and DPW Officials; Debris Removal Contractors; Debris Monitoring Contractors	All Hazards	Vegetative; All Debris	Removal; Segregation; Disposal	Debris Removal Eligibility; Debris Management Sites; Reduction/recycling methods; Private property debris removal; Costs; Debris removal from public property; Federal government operations
Kansas Department of Health and Environment. Debris Management, ESF 3. http://www.kdheks.gov/download/disaster_recovery/ESF_3%20Debris_Management_Appendix.pdf	State or Local Emergency Management; State/Local Agency Staff	All Hazards	Vegetative; C&D; Hazardous waste; HHW; White goods; E-waste	Removal; Monitoring	Roles and Responsibilities; Forecasting; Clearing and collection; Debris Management Sites; Reduction/recycling methods; Contracted Services; Monitoring Debris Removal; Private property debris removal; Debris removal from public property
Mississippi Department of Environmental Quality. Lead-Based Paint Debris Disposal Guidance. April 2001. http://www.deq.state.ms.us/mdeq.nsf/pdf/SW_LeadPaintDisposal/\$File/LeadPaintDisposal.pdf?OpenElement	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors	All Hazards	Hazardous waste	Disposal; Segregation	Debris Management Sites; Reduction/recycling methods; Health and safety; Public Information
South Dakota Department of Public Works. Debris Management Guide. http://dps.sd.gov/emergency_services/emergency_management/images/demagde.pdf	Local DOT and DPW Officials; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; General Public	Hurricane; Tornado; Ice Storm; Flood; Earthquake	Vegetative; C&D; Hazardous waste; HHW; White goods; Vehicles; Garbage; E-waste	Planning; Removal; Monitoring; Contracting; Temporary Sites; Disposal	Debris Removal Eligibility; Roles and Responsibilities; Debris Management Sites; Reduction/recycling methods; Contracted Services; Monitoring Debris Removal; Private property debris removal; Costs; Debris removal from public property
United States Coast Guard. US Coast Guard Federal On Scene Coordinator Representative. August 2007. http://www.uscg.mil/hq/nswfweb/foscr/ASTFOSCRSeminar/References/FOSCRPQS.pdf	State or Local Emergency Management; State/Local Agency Staff	All Hazards	All Debris		Roles and Responsibilities
United States Department of Homeland Security. Incident Site Safety Planning: Personal Protective Equipment. September 2005.	Emergency responders; Field Staff; Debris Removal Contractors; Emergency responders	All Hazards	All Debris	Safe	Health and safety; Field experience/case studies
Virginia Department of Emergency Management. Debris Estimating Tool. http://www.vaemergency.gov/sites/default/files/debris_est_matrix.xls	Field Staff; Debris Removal Contractors; Debris Monitoring Contractors	All Hazards	All Debris	Forecasting	Debris Forecasting
Wisconsin Department of Natural Resources. Cleaning up Storm Debris. http://dnr.wi.gov/topic/Waste/StormDebris.html	General Public; General Public	Flood	All Debris	Removal; Segregation; Disposal	Reduction/recycling methods; Public Information; Debris removal from public property; Field experience/case studies

PLANNING GUIDES

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Connecticut Department of Energy and Environmental Protection. Debris Management Preparedness Resources. September 2008. http://www.ct.gov/dep/lib/dep/waste_management_and_disposal/debris_management/final_ddmp_plan_september_2008_(pdf).pdf	State or Local Agency Staff; State or Local Emergency Management; State/Local Agency Staff; Debris Removal Contractors	All Hazards	All Debris	Planning; Monitoring; Temporary Sites; Disposal	Debris Removal Eligibility; Roles and Responsibilities; Forecasting; Clearing and collection; Debris Management Sites; Reduction/recycling methods; Contracted Services; Debris removal from public property; Federal government operations
Environmental Protection Agency. Planning for Natural Debris Guidelines, EPA530-K-95-010. March 2008. http://www.epa.gov/osw/conserve/rrr/imr/cdm/pubs/pnodd.pdf	State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; General Public	All Hazards	All Debris	Planning; Temporary Sites; Disposal	Debris Removal Eligibility; Reduction/recycling methods; Monitoring Debris Removal; Private property debris removal; Costs; Debris removal from public property; Field experience/case studies
Garner, Freddie. Debris Management Planning. Governor's Office of Homeland Security and Emergency Preparedness. http://gohsep.la.gov/newsrelated/docs/DebrisManag.pdf	State/Local Agency Staff	All Hazards	Vegetative; C&D; Hazardous waste; White goods; Vehicles; Garbage; E-waste	Planning; Removal; Contracting; Temporary Sites; Disposal	Debris Removal Eligibility; Forecasting; Debris Management Sites; Reduction/recycling methods; Contracted Services; Private property debris removal; Field experience/case studies
National Oceanic and Atmospheric Administration. Marine Debris Emergency Response Planning in the North-Central Gulf of Mexico, NOS-OR&R-31. June 2009. http://marinedebris.noaa.gov/projects/pdfs/gom_mderp.pdf	State or Local Emergency Management; State/Local Agency Staff; Debris Removal Contractors; Emergency responders	All Hazards	Vegetative; C&D; Hazardous waste; White goods; Vehicles; Vessels; Garbage	Planning; Removal; Disposal	Debris Removal Eligibility; Roles and Responsibilities; Debris Management Sites; Reduction/recycling methods; Monitoring Debris Removal; Costs; Debris removal from public property; Federal government operations; Field experience/case studies
North Carolina Department of Environment and Natural Resources. Debris Management Resources. http://portal.ncdenr.org/web/wm/sw/dds	State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders; General Public	All Hazards	Vegetative; C&D; HHW; White goods	Planning; Removal; Segregation; Temporary Sites; Disposal	Forecasting; Clearing and collection; Debris Management Sites; Reduction/recycling methods; Contracted Services; Debris removal from public property
Ohio Emergency Management Agency. Debris Planning Workbook For Local Jurisdictions. August 2011. http://ema.ohio.gov/Documents/DRB/Debris_Mgmt_Plan_Wrkbk.xls	Local DOT and DPW Officials; State/Local Agency Staff	All Hazards	All Debris	Planning	Roles and Responsibilities; Clearing and collection; Debris Management Sites; Reduction/recycling methods; Contracted Services; Private property debris removal; Health and safety; Public Information

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Ohio Emergency Management Agency. Sample Local Jurisdiction Standard Operating Guidelines. http://ema.ohio.gov/Documents/DRB/Sample_SOG.doc	Local DOT and DPW Officials; State/Local Agency Staff	All Hazards	All Debris	Planning; Removal; Contracting; Temporary Sites; Disposal; Reimbursement	Roles and Responsibilities; Clearing and collection; Debris Management Sites; Reduction/recycling methods; Costs
Transportation Research Board. National Cooperative Highway Research Program. U.S. Marine Salvage Assets and Capabilities in a Maritime Disaster, TRB Conference Proceedings 45. http://onlinepubs.trb.org/onlinepubs/conf/CP45.pdf	Policy Makers; State or Local Emergency Management; State/Local Agency Staff; Emergency responders	Hurricane; Thunderstorm; Flood	Hazardous waste; Vessels	Removal; Disposal	Roles and Responsibilities; Forecasting; Clearing and collection; Debris Management Sites; Reduction/recycling methods; Monitoring Debris Removal; Debris removal from waterways; Federal government operations; Field experience/case studies

LAWS AND REGULATIONS

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Castillo, Carlos J. Section 324 Management Costs and Direct Administrative Costs, Recovery Policy 9525.9. Federal Emergency Management Agency. 12 March 2008. http://www.fema.gov/pdf/government/grant/pa/9525_9.pdf	Policy Makers; State/Local Agency Staff	All Hazards	All Debris	Contracting	Debris Removal Eligibility; Costs; Field experience/case studies
Federal Emergency Management Agency. Public Assistance Guide, FEMA 322. June 2007. http://www.fema.gov/government/grant/pa/pag07_t.shtm	State or Local Agency Staff; State DOT and DPW Officials; Local DOT and DPW Officials; Field Staff	All Hazards	All Debris	Reimbursement; Policy; Removal	Debris Removal Eligibility; Private property debris removal; Costs; Debris removal from public property; Debris monitoring eligibility; Federal government operations
Federal Emergency Management Agency. Public Assistance Policy Digest, FEMA 321. January 2008. http://www.fema.gov/government/grant/pa/padocs.shtm	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff	All Hazards	All Debris	Removal; Disposal; Reimbursement	Debris Removal Eligibility; Costs
Federal Emergency Management Agency. Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-707, amended by the Disaster Relief Act of 1974, PL 93-288, FEMA 592. June 2007. https://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=3564	Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors; Emergency responders	All Hazards	All Debris	Removal	Debris Removal Eligibility; Roles and Responsibilities; Contracted Services; Federal government operations
Luther, Linda. Managing Disaster Debris: Overview of Regulatory Requirements, Agency Roles, and Selected Challenges. Congressional Research Service. 13 January 2011. http://www.fas.org/sqp/crs/misc/RL34576.pdf	Policy Makers	All Hazards	Vegetative; C&D; Hazardous waste; HHW; White goods; Soil, mud, and sand; Vehicles; Vessels; Putrescent/ Infectious waste; Garbage; E-waste	Policy	Debris Removal Eligibility; Debris Management Sites; Reduction/recycling methods; Federal government operations
McCarthy, Francis X and J Brown. Congressional Primer on Major Disasters and Emergencies, 7-5700. Congressional Research Service. 31 August 2011. http://www.fas.org/sqp/crs/homesecc/R41981.pdf	Policy Makers; State/Local Agency Staff	All Hazards	All Debris	Removal	Costs; Federal government operations
Simonson, Davy. U.S. EPA Roles, Responsibilities, Relationships in Disaster Debris Management. Environmental Protection Agency. 15 April 2008.	Federal government	All Hazards	Hazardous Waste; HHW; White goods; All	Policy; Policy; Removal; Monitoring;	Debris Removal Eligibility; Roles and Responsibilities; Debris Management Sites; Reduction/recycling methods; Monitoring

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
http://www.forestsandrangelands.gov/Woody_Biomass/news_events/documents/recoveryUtilizationWorkshop2008/USEPA_Roles.pdf			Debris	Temporary Sites; Disposal	Debris Removal
Suiter, Lacy E. Payment of Contractors for Grant Management Tasks, Recovery Policy 9525.11. Federal Emergency Management Agency. 22 April 2001. http://www.fema.gov/government/grant/pa/9525_11.shtm	Policy Makers; State/Local Agency Staff	All Hazards	All Debris	Contracting; Reimbursement	Roles and Responsibilities; Contracted Services; Costs
United States Congress. SAFE Port Act, US Public Law No. 109-347. 109th Congress. 14 March 2006. http://thomas.loc.gov/cgi-bin/bdquery/D?d109:3:./temp/~bdgb1W:@@D&summ2=m&/home/LegislativeData.php?n=BSS;c=109	Policy Makers	All Hazards	All Debris	Policy; Reimbursement	Debris Removal Eligibility
United States Congress. Water Resources Development Act of 2007 debris provision, Public Law 110–114. 110th Congress. 4 January 2007. http://www.govtrack.us/congress/bills/110/hr1495/text	Policy Makers	Hurricane	C&D	Removal; Segregation; Disposal; Reimbursement	Debris Removal Eligibility
United States House of Representatives. American Energy and Infrastructure Jobs Act of 2012, HR 7. 112th Congress. 15 February 2012. http://thomas.loc.gov/cgi-bin/bdquery/D?d112:1:./temp/~bdH6Uj:@@D&summ2=m&/home/LegislativeData.php?n=BSS;c=112	Policy Makers	All Hazards	All Debris	Reimbursement	Debris Removal Eligibility
United States House of Representatives. Marine Debris Act Reauthorization Amendments of 2011, HR 1171. 112th Congress. 17 March 2011. http://thomas.loc.gov/cgi-bin/bdquery/z?d112:h.r.1171:	Policy Makers	All Hazards	Marine	Planning; Removal	Forecasting; Debris removal from waterways
United States House of Representatives. Responding Equitably, Swiftly, Proportionally, and On-time to Natural Disasters Act of 2005, HR 1137. 109th Congress. 8 March 2005. http://thomas.loc.gov/cgi-bin/bdquery/D?d109:1:./temp/~bdgb1W:@@D&summ2=m&/home/LegislativeData.php?n=BSS;c=109	Policy Makers	Hurricane; All Hazards	All Debris	Policy	Debris Removal Eligibility; Private property debris removal
United States House of Representatives. Response, Recovery, and Mitigation Enhancement Act of 2009, HR 3377. 111th Congress. 29 July 2009. http://thomas.loc.gov/cgi-bin/bdquery/D?d111:1:./temp/~bdOHcS:@@D&summ2=m&/home/LegislativeData.php?n=BSS;c=111	Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff	All Hazards	All Debris	Reimbursement; Planning	Debris Removal Eligibility
United States Office of Management and Budget. Cost Principles for State, Local, and Indian Tribal Governments, OMB CIRCULAR A-87 REVISED. 10 May 2004. http://www.whitehouse.gov/omb/circulars_a087_2004	Policy Makers; State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff	NA	All Debris	Reimbursement	Cost considerations
United States Senate. Debris Removal Act of 2005, S 939. 109th Congress. 30 August 2006. http://thomas.loc.gov/cgi-bin/cpquery/R?cp109:FLD010:@1(sr320)	Policy Makers; State DOT Officials; State or Local Emergency Management; Local DOT Officials; State/Local Agency Staff	All Hazards	All Debris	Reimbursement	Debris Removal Eligibility

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
United States Senate. Post-Katrina Emergency Management Reform Act of 2006, S 3721. 109th Congress. 25 July 2006. http://thomas.loc.gov/cgi-bin/bdquery/D?d109:5:./temp/~bdgb1W:@@D&summ2=m&/home/LegislativeData.php?n=BSS;c=109	Policy Makers	Hurricane; All Hazards	All Debris	Policy; Contracting; Segregation; Reimbursement	Debris Removal Eligibility; Roles and Responsibilities; Debris Management Sites; Contracted Services

OTHER PUBLICATIONS

Citation	Audiences	Hazards	Debris Types	Debris Management Phases	Topics Covered
Abbe, Timothy B and David R. Montgomery. Large woody debris jams, channel hydraulics and habitat formation in large rivers. University of Washington. March 1996. http://www2.uvm.edu/~pbierman/classes/gradsem/2005/papers/abbe1996.pdf	Debris Removal Contractors	All Hazards	Vegetative	Marine Debris	Debris removal from waterways
Brickner, Robert H. Researching debris generation. Recycling Today. 29 August 2001. http://www.recyclingtoday.com/Author.aspx?AuthorID=2855	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; Debris Removal Contractors	All Hazards	C&D; Vegetative	Disposal; Generation	Reduction/recycling methods
Brown, Charlotte. Planning for Disaster Debris Management. Department of Civil and Natural Resources Engineering. University of Canterbury. http://ir.canterbury.ac.nz/bitstream/10092/3669/1/12621629_WasteMI_NZ_final.pdf	State or Local Emergency Management; Debris Removal Contractors; Emergency responders	All Hazards	All Debris	Planning; All Phases	Field experience/case studies
Environmental Protection Agency. Disaster Debris. http://www.epa.gov/osw/conservation/rrr/imr/cdm/debris.htm	General Public	All Hazards	Vegetative; C&D; Soil, mud, and sand; Garbage	Disposal	Private property debris removal
Louisiana Department of Environmental Quality. Electronic Goods Summary Table. Progress Reports for Hurricanes Katrina and Rita. 13 August 2006. http://www.deq.louisiana.gov/portal/portals/0/news/pdf/ElectronicGoodsAndFr1.pdf	Policy Makers; State DPW Officials; State or Local Emergency Management; Local DPW Officials; State/Local Agency Staff; Field Staff; Debris Removal Contractors; Debris Monitoring Contractors	Hurricane; Flood	E-waste; Hazardous waste	Disposal; Removal; Monitoring; Contracting; Segregation	Forecasting; Debris Clearing and Collection Strategy
Major, David. Marine Debris: Solution to a persistent problem. United States Coast Guard. January 2009. http://uscg.mil/proceedings/Winter2008-09/articles/52_Major_Marine%20Debris.pdf	Policy Makers; Field Staff; USCG	All Hazards	Garbage	Removal; Prevention	Debris Management Sites; Debris removal from public property; Debris removal from waterways
Transportation Research Board. National Cooperative Highway Research Program. The Provision Of A Highway Disaster Prevention Information Network For The Eruption Of Mt. Unzen-Fugendake. http://trid.trb.org/view/1995/C/463026	State DOT and DPW Officials; State or Local Emergency Management; Local DOT and DPW Officials; State/Local Agency Staff; Emergency responders; General Public	All Hazards	All Debris	Planning	Forecasting; Debris Management Sites; Field experience/case studies
Wolshon, Brian. Transportation's Role in Emergency Evacuation and Reentry, Synthesis 932. National Cooperative Highway Research Program. 2009. http://trid.trb.org/view/2009/M/886063	State DOT Officials; Policy Makers; Local DOT Officials	All Hazards	All Debris	Removal	Debris Clearing and Collection Strategy

PLANS

NOTE: Additional plans will be identified and reviewed through the field survey. This preliminary list represents plans available through subject matter expertise and Google searches.

Alameda Waste Management Authority. Alameda County Disaster Waste Management Plan. Alameda County, State of California. 19 November 1998

California Emergency Management Agency. Integrated Waste Management Disaster Plan. State of California. January 1997

Glynn County Emergency Management Agency. Debris Management Plan. Glynn County, State of Georgia.

Governor's Office of Homeland Security and Emergency Preparedness. State of Louisiana Emergency Operation Plans and Resources. State of Louisiana. July 2009

Illinois Emergency Management Agency. Disaster Recovery Plan--Annex F Debris Removal. State of Illinois. September 2011

Leesburg Department of Public Works. Disaster Debris Management Plan. City of Leesburg, State of Florida.

Los Angeles Department of Public Works. Debris Management Plan. City of Los Angeles, State of California. March 2008

Louisiana Department of Environmental Quality. Comprehensive Plan and Resources for Disaster Clean-up and Debris Management. State of Louisiana. September 2010

Ohio Emergency Management Agency. Sample County Debris Plan. State of Ohio.

Oregon Office of Emergency Management. Regional Debris Management Plan. Region 1, State of Oregon. December 2008

NCHRP TRB Debris Management Handbook

Task 1: Literature Review Methodology Report

Overview

The literature review task was conducted to identify and evaluate the available body of literature related to all aspects of debris management. The results of the literature review will, in part, inform the development of an outline for the TRB Debris Handbook. Dewberry reviewed a number of publication types, including books, periodicals, plans, and guidance documents culled together from a variety of sources. The data gleaned from each publication was compiled into a sortable, searchable database, which was used to prepare an annotated bibliography. The database will also be used to identify background material and gaps for the development of the Debris Management Handbook.

Approach

The Literature Review was conducted in three overlapping tasks: identifying publications, developing review criteria, and reviewing publications.

Identifying Publications

To begin identifying publications for possible inclusion in the literature review, Dewberry's debris subject matter experts identified some primary source documents and databases to search. The initial resource list included several debris management guidance documents developed by the Federal Emergency Management Agency (FEMA). The databases searched included:

- FEMA Library
- Transport Research International Documentation (TRID)
- Thomas (Library of Congress)
- Lessons Learned Information Sharing (LLIS)
- International Risk Management Institute (IRMI)
- ISI Web of Science

Database searches were supplemented by standard internet searches via Google. In addition, Dewberry reviewed the reference list in each publication to identify additional sources for consideration.

In some cases, publications identified for review were deemed to be irrelevant, duplicative, or otherwise not beneficial to the development of the Handbook and were therefore dismissed. These determinations were made at the discretion of the reviewer and informed by the review criteria. In addition, publications that were only available for purchase or in a language other than English were not reviewed.

Field Survey

Task 2 of the Debris Management Handbook development project is a field survey, which, in part, will help to identify additional plans and publications for review. At the time this report was written, the field survey was still in progress; some publications identified as a result of the survey responses received to

Literature Review Methodology Report

date are included in the review, and additional publications are expected to be added as more responses are received.

Constraints

The Literature Review was conducted using only publications that are available at no cost and written in English. While every attempt was made to conduct as thorough a review as possible, Dewberry recognizes that it was not possible to review every single plan, publication, and article related to debris management. Therefore, the Literature Review represents a cross-section of debris-related literature but may not include every document ever published on debris management.

Developing Review Criteria

Literature Review criteria were developed in consultation with Dewberry's debris subject matter experts. The initial criteria were based on the principles outlined in FEMA 325, *Debris Management Guide*; these criteria were expanded to include topics not covered in FEMA 325 as well as transportation-specific topic areas. The criteria were reviewed and approved by the Panel. Review criteria included general citation information (title, journal, organization, author, etc.) as well as classification information, content, and usefulness.

Classification

Each publication was classified based on five categories: publication type, target audience and application, hazard, debris type, and debris management cycle phase. These categories were used to sort the publications as well as to give a snapshot of the publication's content.

- *Publication type* refers to the format of the publication as well as how the information was presented. Publication types include bulletin, checklist, field guide, job aid, regulation, brochure, standard operating procedure, overview, field report, legislation, and other types of publications. Note that the publication type classification was limited to a single value for each publication.
- *Target audience* refers to the stated audience for which the publication was written. *Application* refers to the audiences that could benefit from the publication. Audiences include policy makers, state department of transportation (DOT) officials, state department of public works (DPW) officials, state or local emergency managers, local DOT officials, local DPW officials, state or local agency staff, field staff, debris removal contractors, debris monitoring contractors, emergency responders, and the general public. Note that reviewers could select as many audiences as applied to each publication, with the option of also selecting a primary audience.
- *Hazard* refers to the debris-causing hazard that the publication discusses. Hazards include hurricane, tornado, thunderstorm, ice storm, flood, earthquake, wildfire, snow, manmade hazards, all natural hazards, and all hazards. Note that reviewers could select as many hazards as applied, with the option of also selecting a primary hazard.
- *Debris type* refers to the type of debris discussed in the publication. Types include vegetative, construction/demolition, chemical, biological, radiological, nuclear, and explosive waste (CBRNE), hazardous waste, household hazardous waste, white goods, soil, mud and sand, vehicles, vessels, putrescent or infectious waste, garbage, electronic waste, snow, all types, and other types. Note that reviewers could select as many types as applied, with the option of also selecting a primary type.
- *Debris management cycle phase* refers to the phase of the debris management cycle discussed in the publication. Phases include planning, policy, removal, monitoring, contracting, segregation,

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temporary sites, disposal, and reimbursement. Note that reviewers could select as many phases as applied, with the option of also selecting a primary phase.

Content

Content criteria were developed to identify general themes discussed in each publication as well as specific topic areas. Sixteen topic areas were identified, each with up to seven subcategories. Reviewers were asked to select the topics and subtopics discussed in each publication and to provide additional comments and information that might be useful to the writers of the Handbook. Topics included: debris removal eligibility, roles and responsibilities, debris forecasting, debris clearing and collection strategy, debris management sites, debris reduction and recycling methods and disposal, contracted services, monitoring debris removal, private property debris removal and demolition, health and safety, public information, costs, debris removal from public property, debris removal from waterways, debris monitoring eligibility, and federal government operations.

In addition to the specific topics, reviewers were asked to indicate whether each publication contained lessons learned, best practices, or case studies. Reviewers also were given the option of specifying additional topics discussed in each publication. Finally, reviewers were asked to list debris-related references included in each publication in order to identify additional sources for review.

Usefulness

Usefulness criteria were developed as a way to identify which publications would be most helpful and relevant in writing the Handbook. These criteria were highly subjective and will not be included in the annotated bibliography; however, they will be used during the writing of the Handbook to identify which of the over 160 publications should be reviewed for background.

There were two usefulness criteria. The first asked reviewers to select whether the publication was very useful, somewhat useful, or not useful. The second asked reviewers to identify whether the publication was very actionable, somewhat actionable, informational but not actionable, or not informational or actionable.

Plans

Because debris management plans serve a different purpose than guidance documents, policies, brochures, and field reports, they were reviewed by different criteria. The plan review criteria were developed based on the Public Assistance Pilot Program Increased Federal Share Incentive Checklist and tracked in a separate database. The plan review criteria are presented in Appendix B.

Reviewing Publications

Because of the volume of publications reviewed, multiple Dewberry analysts participated in the Literature Review. To ensure consistency, each publication was reviewed using a data-restricted form that required reviewers to enter information in a specific way. Each form was then logged into the Literature Review Database to ensure that conventions were consistent across reviewers. Both the form and the database were created in Microsoft Excel. The Literature Review Form is presented in Appendix A. The Literature Review Database is a separate deliverable to this task.

Literature Review Methodology Report

Outcomes

At the time of the development of this report, over 160 publications and 12 plans were reviewed for information. The literature review had two primary outcomes:

1. An annotated bibliography, which serves as the Task 1 deliverable and will be included in the final Handbook; and
2. The Literature Review Database, which will be used to sort and compile information for the writing of the Handbook.

Appendix A: Literature Review Form

Debris Management Handbook Literature Review Form

Identification Information

Internal ID: _____

Publication Title: _____
Pub Number: _____ Pub Date: _____
Source/Journal: _____ Organization: _____
Primary Author: _____ Link: _____
Other Authors: _____ Other Citation Info: _____
Publication Type: _____
Reviewer Name: _____ Review Date: _____

Classification Information

Primary Stated Target Audience:

Other Target Audiences (select as many as apply):

<input type="checkbox"/> Policy makers	<input type="checkbox"/> State officials	<input type="checkbox"/> Local officials
<input type="checkbox"/> Contractors	<input type="checkbox"/> Emergency responders	<input type="checkbox"/> General Public

Comments: _____

This pub applies primarily to:

This pub also contains information useful to these audiences (select as many as apply):

<input type="checkbox"/> Policy makers	<input type="checkbox"/> State DOT Officials	<input type="checkbox"/> State DPW Officials
<input type="checkbox"/> State/Local EM	<input type="checkbox"/> Local DOT Officials	<input type="checkbox"/> Local DPW Officials
<input type="checkbox"/> State/Local Agency Staff	<input type="checkbox"/> Field Staff	<input type="checkbox"/> Removal Contractors
<input type="checkbox"/> Monitoring Contractors	<input type="checkbox"/> Emergency Responders	<input type="checkbox"/> General Public

Comments: _____

Primary Hazard:

Other hazards (select as many as apply):

<input type="checkbox"/> Hurricane	<input type="checkbox"/> Tornado	<input type="checkbox"/> Thunderstorm
<input type="checkbox"/> Ice Storm	<input type="checkbox"/> Flood	<input type="checkbox"/> Earthquake
<input type="checkbox"/> Wildfire	<input type="checkbox"/> Manmade	<input type="checkbox"/> Snow
<input type="checkbox"/> All Hazards	<input type="checkbox"/> Other: _____	

Comments: _____

Primary Debris Type:

Other debris types (select as many as apply):

<input type="checkbox"/> Vegetative	<input type="checkbox"/> Constr/Demo	<input type="checkbox"/> CBRNE
<input type="checkbox"/> Hazardous Waste	<input type="checkbox"/> HHW	<input type="checkbox"/> White goods
<input type="checkbox"/> Soil, mud, and sand	<input type="checkbox"/> Vehicles	<input type="checkbox"/> Vessels
<input type="checkbox"/> Putrescent/Infectious	<input type="checkbox"/> Garbage	<input type="checkbox"/> Electronic Waste
<input type="checkbox"/> Snow	<input type="checkbox"/> All Types	<input type="checkbox"/> Other: _____

Comments: _____

Primary DM Cycle Phase:

Other debris management cycle phases (select as many as apply):

<input type="checkbox"/> Planning	<input type="checkbox"/> Policy	<input type="checkbox"/> Removal
<input type="checkbox"/> Monitoring	<input type="checkbox"/> Contracting	<input type="checkbox"/> Segregation
<input type="checkbox"/> Temporary Sites	<input type="checkbox"/> Disposal	<input type="checkbox"/> Reimbursement
<input type="checkbox"/> All Cycles		

Comments: _____

Literature Review Methodology Report

Content		
<i>Debris Removal Eligibility</i>		
<input type="checkbox"/>	PA Grant Program	<input type="checkbox"/> General Eligibility Criteria
<input type="checkbox"/>	Env and Historic Preservation	<input type="checkbox"/> Duplication of Benefits
<input type="checkbox"/>	Other Federal Programs:	
Comments:		
<i>Roles and Responsibilities</i>		
<input type="checkbox"/>	Staff organization and structure	<input type="checkbox"/> Staff responsibilities
Comments:		
<i>Debris forecasting for a design event</i>		
<input type="checkbox"/>	Design disaster event	<input type="checkbox"/> Land use and geography
<input type="checkbox"/>	Forecasting methods	
Comments:		
<i>Debris clearing and collection strategy</i>		
<input type="checkbox"/>	Developing a strategy	<input type="checkbox"/> Types of collection methods
<input type="checkbox"/>	Hazardous waste/white goods	<input type="checkbox"/> Prioritizing routes
Comments:		
<i>Debris management sites</i>		
<input type="checkbox"/>	Identifying sites	<input type="checkbox"/> Data collection
<input type="checkbox"/>	Environmental monitoring	<input type="checkbox"/> Permits
<input type="checkbox"/>	Establishment and ops planning	<input type="checkbox"/> Use of sites in general
Comments:		
<i>Debris reduction/recycling methods and disposal</i>		
<input type="checkbox"/>	Disposal methods	<input type="checkbox"/> Recycling
<input type="checkbox"/>	Final disposition operations	
Comments:		
<i>Contracted services</i>		
<input type="checkbox"/>	Procurement considerations	<input type="checkbox"/> Contract provisions
<input type="checkbox"/>	Types of contracts	
Comments:		
<i>Monitoring debris removal</i>		
<input type="checkbox"/>	Debris monitoring staff	<input type="checkbox"/> Debris monitor roles
<input type="checkbox"/>	Monitoring methods	
Comments:		
<i>Private property debris removal and demolition</i>		
<input type="checkbox"/>	Labor resources	<input type="checkbox"/> Condemnation
<input type="checkbox"/>	Special use areas	<input type="checkbox"/> Private party debris removal
<input type="checkbox"/>	Demolition of private structures	<input type="checkbox"/> Commercial property
<input type="checkbox"/>	Duplication of benefits	
Comments:		
<i>Health and Safety</i>		
Comments:		
<i>Public Information</i>		
Comments:		
<i>Costs</i>		
<input type="checkbox"/>	Applicant resources	<input type="checkbox"/> Mutual aid agreements
<input type="checkbox"/>	Contract services and considerations	
Comments:		
<i>Debris removal from public property</i>		
<input type="checkbox"/>	Eligible/ineligible activities	<input type="checkbox"/> Clearance and removal operations
<input type="checkbox"/>	Field eligibility determinations	<input type="checkbox"/> Monitoring removal operations
<input type="checkbox"/>	Disposal	

Debris removal from waterways	
-------------------------------	--

Debris monitoring eligibility	
-------------------------------	--

Federal government operations	
-------------------------------	--

Other Federal assistance (specify): _____

Field Experience/Case Studies	
-------------------------------	--

☐ Specific Examples? List Page: _____

Other Topic Areas (special considerations, unique circumstances, etc.)		
--	--	--

Evaluation

How useful is this publication? _____

How actionable is this publication?

References (List all debris-specific documents referenced in this publication):

Public Assistance Pilot Program Increased Federal Share Incentive Checklist

Applicant _____ PA ID _____ DR- _____

Point of Contact _____ Phone Number _____

Yes No

Debris Management Plan

- | | | |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Does the plan outline the roles and responsibilities of the various functions identified (Public Works, Finance, and Solid Waste Departments, etc.)? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does the plan address health and safety procedures in accordance with State/Local health and safety standards/requirements? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does the plan identify procedures for acquiring required regulatory permits? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does the plan address the basis for planning which include assumptions for various events and forecasting/modeling for debris volumes? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does the plan include priorities for the clearance, collection, and disposal of debris? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does the plan address recycling? |
| <input type="checkbox"/> | <input type="checkbox"/> | Is there a process for the collection and disposal of hazardous waste and/or white goods? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does the plan address debris monitoring of the pickup sites, Debris Management Sites (DMS) or Temporary Debris Storage and Reduction Sites (TDSR) and final disposal? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does the plan identify DMS' or TDSRs' and potential landfills for final disposal to include operation and site management procedures and staffing? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does the plan address the environmental requirements? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does the plan address contracting/procurement procedures? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does the plan address the authority and processes for private property debris removal? |

Literature Review Methodology Report

Yes

No

☐☐

Does the plan address the dissemination of information to the general public and media?

List of Pre-qualified contractors

☐☐

Does the applicant have a list of pre-qualified contractors?

☐☐

Does the applicant have documentation demonstrating how the list was obtained?

TRB DEBRIS MANAGEMENT HANDBOOK

FIELD SURVEY ANALYSIS

FEBRUARY 5, 2013

CONTENTS

Introduction and Methodology	2
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Field Survey Analysis

INTRODUCTION AND METHODOLOGY

Dewberry conducted two sets of reviews to inform the development of the Debris Management Handbook. The first review, a literature review, focused on policies, plans, guidelines, and other documents. The second review, which involved a review of field experience with debris management, was facilitated by an online survey sent to state and local staff. This report summarizes the preliminary findings of the field experience survey.

Analysis was conducted on survey responses received through July 15, 2012 then updated on September 29, 2012 after the survey was closed.

The survey was sent out as a Google form, and survey responses were analyzed in Microsoft Excel. Survey questions were developed by Dewberry's subject matter experts with the following objectives:

1. Identify trends and the "state of the art" of debris management among state and local staff
2. Identify additional plans and publications for inclusion in the literature review
3. Identify potential interviewees for expanded Case Studies to be developed

The survey is included as Appendix A.

RESPONDENTS

The survey was emailed to State and local representatives through the following organizations (membership numbers for the organizations are shown in parentheses):

- Transportation Research Board (TRB) state representatives (50)
- International City/County Management Association (ICMA) (9,000)
- American Public Works Association (APWA) (28,600)
- Solid Waste Association of North America (SWANA) (8,000)
- International Association of Emergency Managers (IAEM) (5,000)

Total: 50,650

While most of these organizations have large membership bases, interests of their members vary, meaning a good number of their membership may not deal with debris issues. We did not anticipate a huge response rate and were pleased with the responses we received from a diverse group of respondents. A total of 166 responses were received, mostly representing local governments. The distribution of survey respondents is presented in Figure 1.

Field Survey Analysis

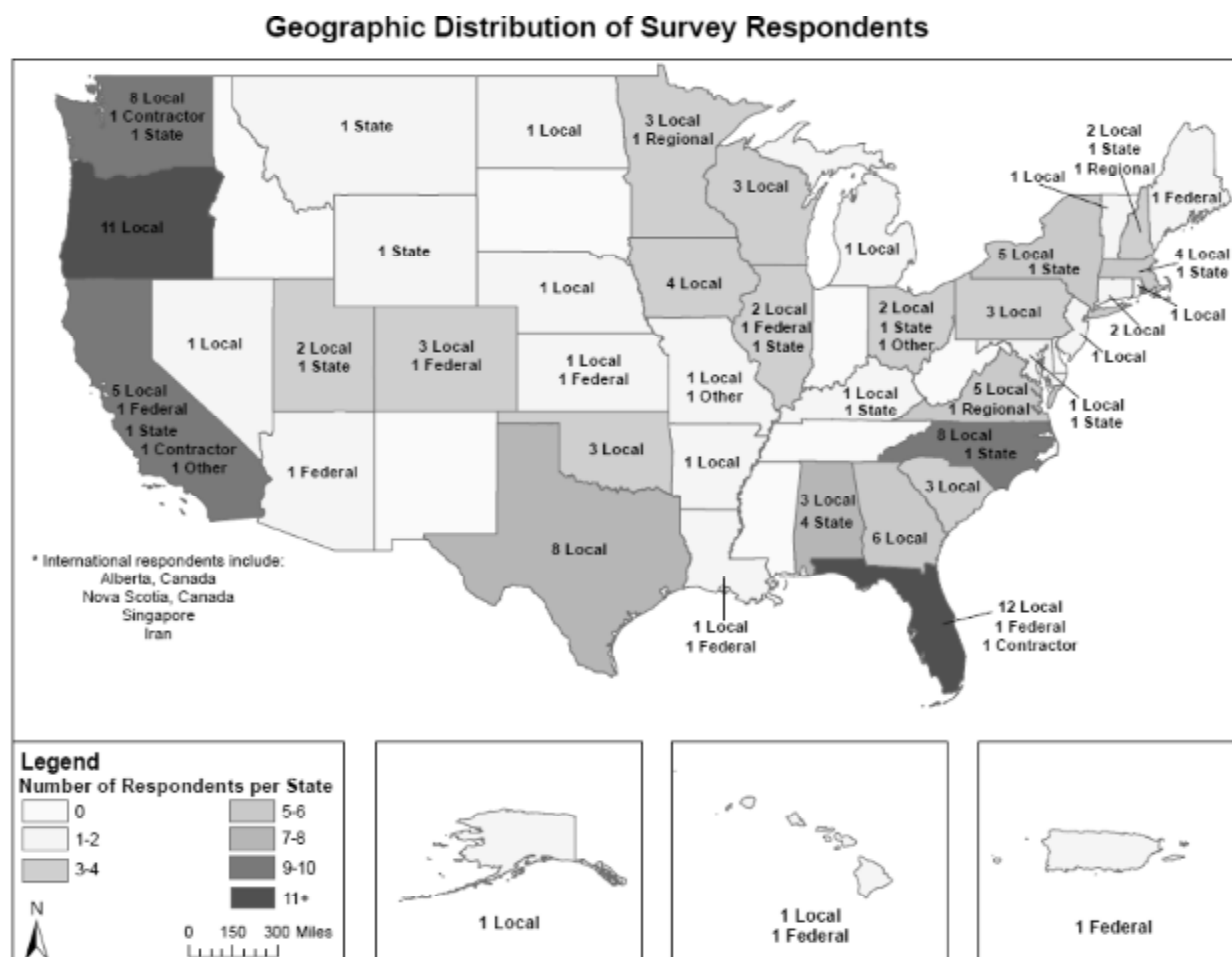


FIGURE 1: DISTRIBUTION OF SURVEY RESPONDENTS

The majority (43%) of survey respondents represented local public works, and an additional 31% of survey respondents represented other local agencies. A small percentage (3%) of respondents was from international organizations, including Iran, Singapore, and Canada. Figure 2 shows the distribution of respondents by organization type.

Field Survey Analysis

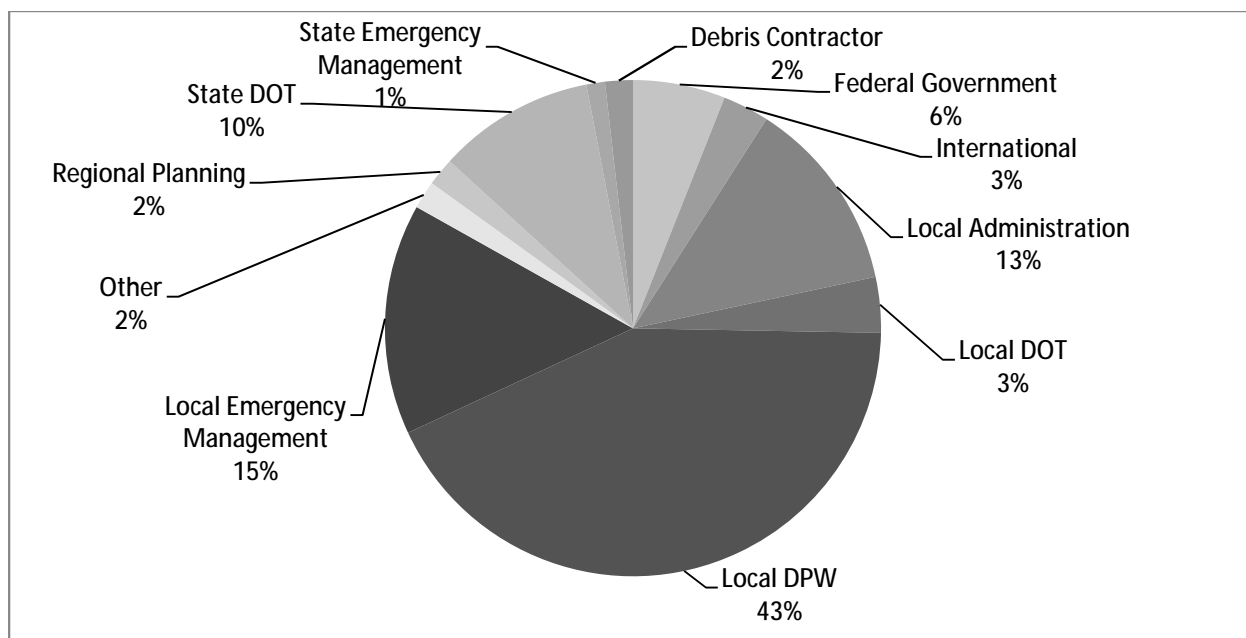


FIGURE 2: RESPONDENTS BY TYPE OF ORGANIZATION

TRENDS

The following analyses represent trends in all data as of September 29, 2012.

DEBRIS MANAGEMENT DOCUMENTS

One goal of the survey was to identify the types of publications used by local jurisdictions. Respondents were asked about four types of documents—plans, policies, field experience and lessons learned documents, and pre-positioned contracts—and were asked to list or provide links to documents for review. The questions were phrased as follows:

- Does your organization have debris management plans?
- Does your organization have debris management policies?
- Does your organization have documents you've prepared that describe your field experience and lessons learned?
- Does your organization have standard, pre-positioned contracts for debris management?

Figure 3 shows the distribution of respondents with plans, policies, lessons learned documents, and pre-positioned contracts. Note that about half of all respondents had plans available and less than one third of respondents had policies or pre-positioned contracts available. Approximately 11% of respondents had prepared field experience or lessons learned documents; many noted that most lessons learned in their organization are not written down.

Field Survey Analysis

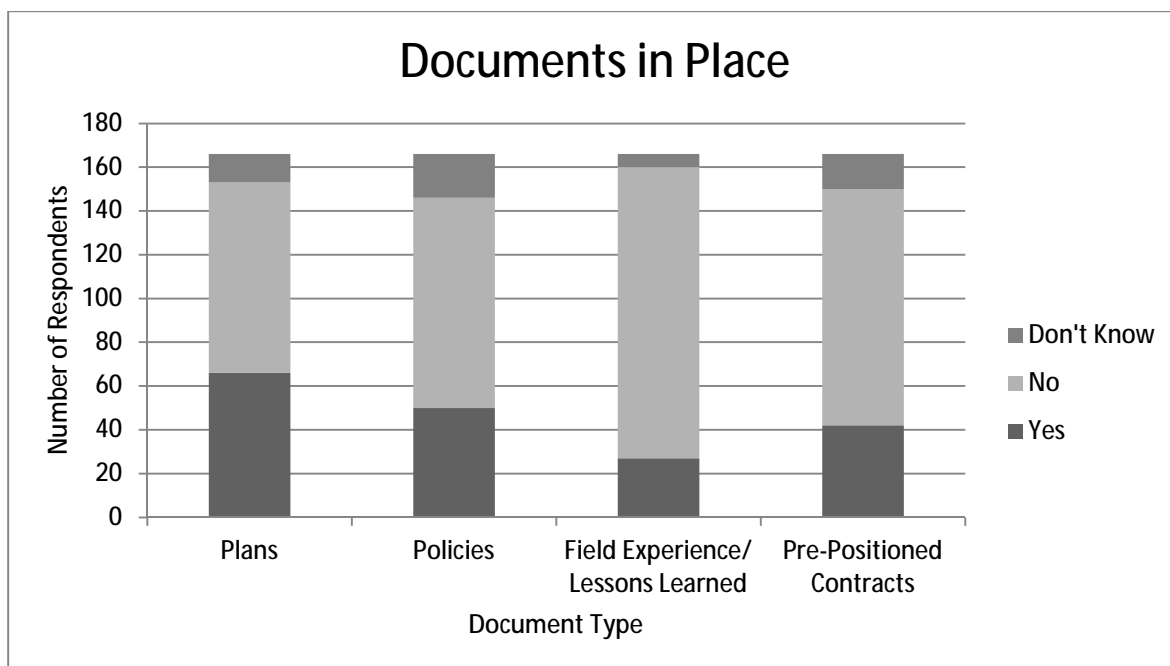


FIGURE 3: DOCUMENTS AVAILABLE TO RESPONDENTS

Figure 4 and Figure 5 illustrate documents in place for state and local respondents, respectively. Note that more local respondents than state respondents stated that they had policies in place; similarly, more local respondents than state respondents stated that they had documents discussing field experience and lessons learned. This may speak to the relative sizes of state and local agencies. In smaller, local agencies, one or a few individuals have responsibility for debris management. They may therefore know their own literature better than individuals working for a larger, state agency. Local staff may also have more of a stake in formalizing policies and writing up lessons learned, as they have fewer resources to deal with future debris management events.

Field Survey Analysis

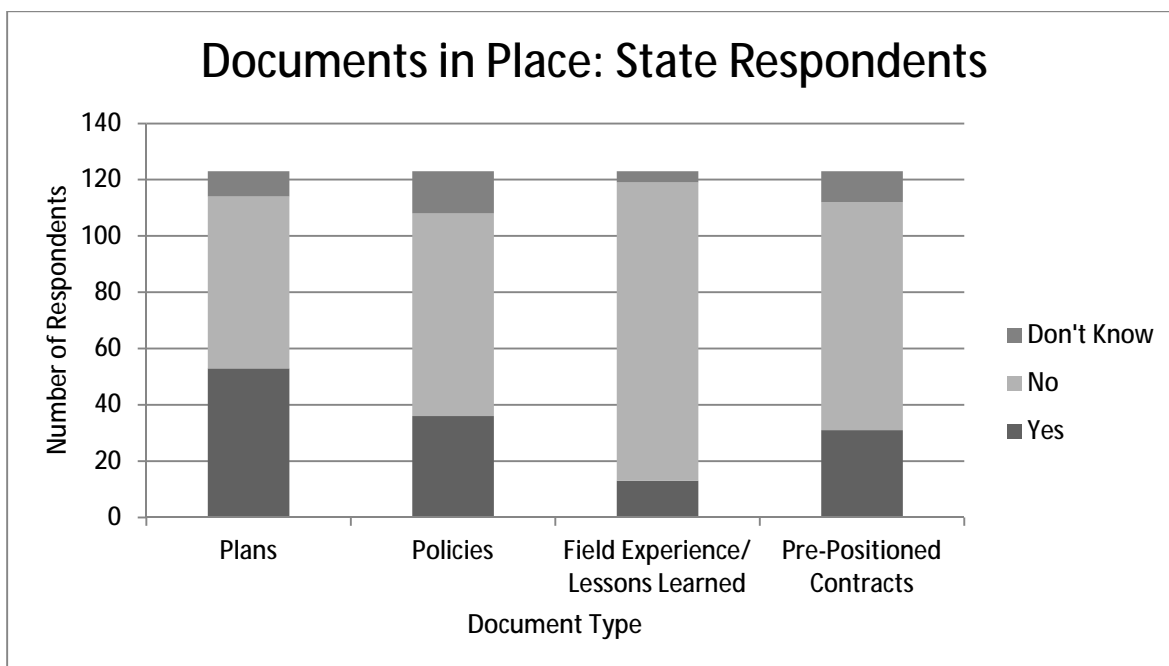


FIGURE 4: DOCUMENTS AVAILABLE TO STATE RESPONDENTS

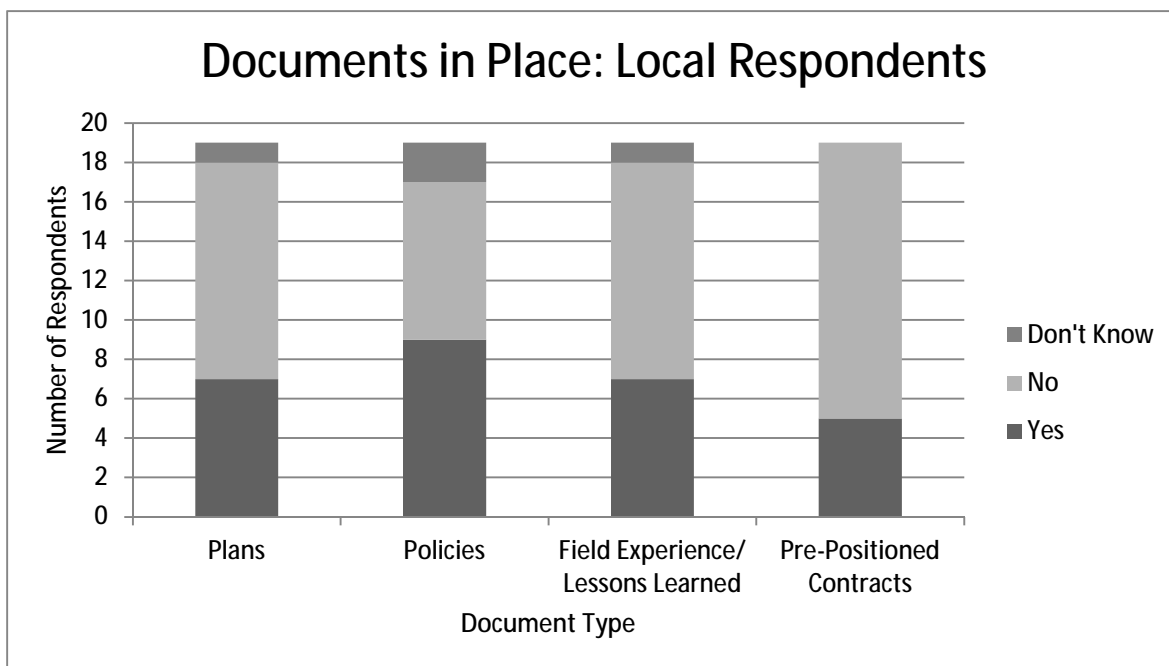


FIGURE 5: DOCUMENTS IN PLACE FOR LOCAL RESPONDENTS

Field Survey Analysis

DEBRIS MANAGEMENT SITES

Respondents were asked whether their organization had identified debris management sites. Figure 6 shows the distribution of responses to the question “Have you identified debris management sites?” It is notable that 31% of all respondents reported that their jurisdictions own their own debris management sites, and another 24% have identified sites and developed agreements to use them. It is also notable that nearly a quarter of respondents did not know whether their jurisdiction had identified debris management sites.

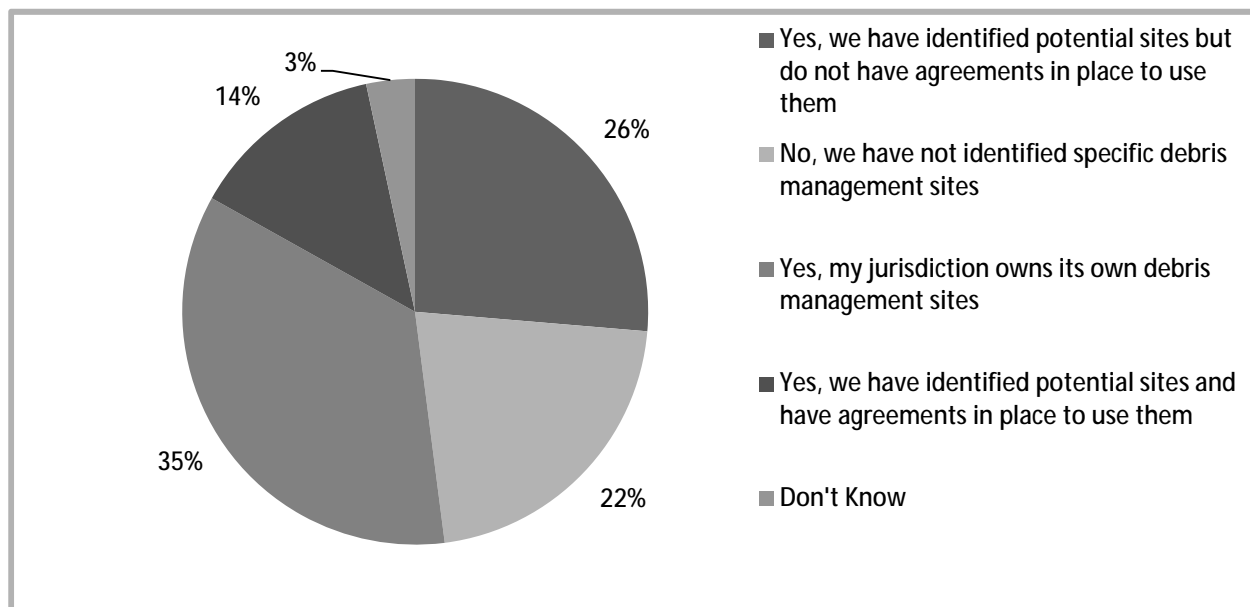


FIGURE 6: DEBRIS MANAGEMENT SITES

DEBRIS MANAGEMENT EXPERIENCE

Understanding the level of debris management experience was a key goal of the field survey. Respondents were first asked to identify the number of debris management events in which they have participated. Respondents were then asked to identify the specific phases of the debris management cycle in which they have experience, including the areas in which they were most confident and the areas in which they felt the most challenged.

Figure 7 shows the distribution of experience among respondents. It is notable that the vast majority of respondents (nearly 60%) have participated in 1-5 debris management events, whereas only 3% of respondents have participated in more than 10 debris management events. This may speak to a gap in debris management knowledge as an older generation retires and a younger generation takes on debris management responsibilities.

Field Survey Analysis

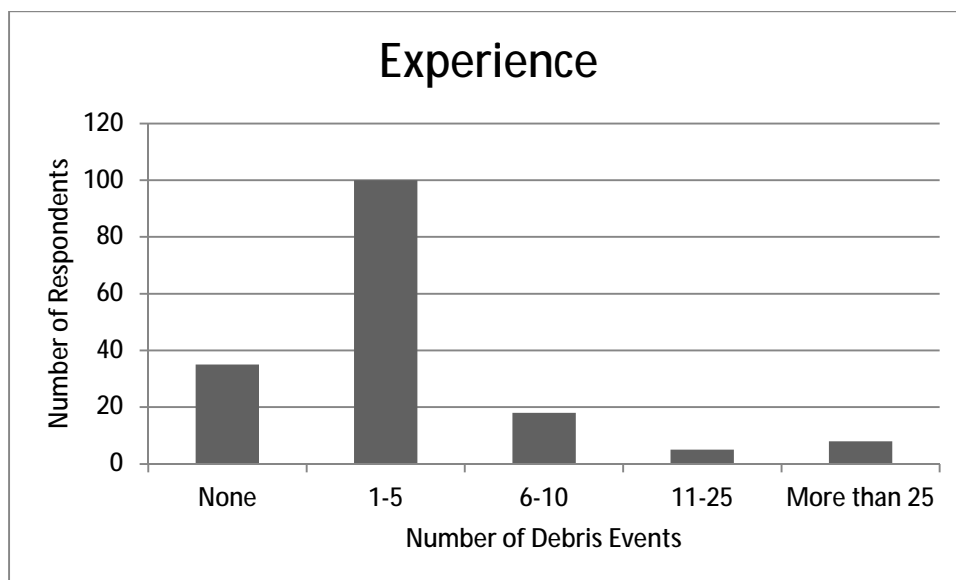


FIGURE 7: LEVEL OF EXPERIENCE

Respondents were asked to identify the specific phases of the cycle in which they have had experience, and then to identify those phases in which they felt most confident and most challenged. Planning, removal, monitoring, and contracting were areas of highest confidence, and policy, segregation, and reimbursement were the areas in which respondents felt most challenged. Figure 8 and Figure 9 present alternate views of the same areas of experience, confidence, and challenge.

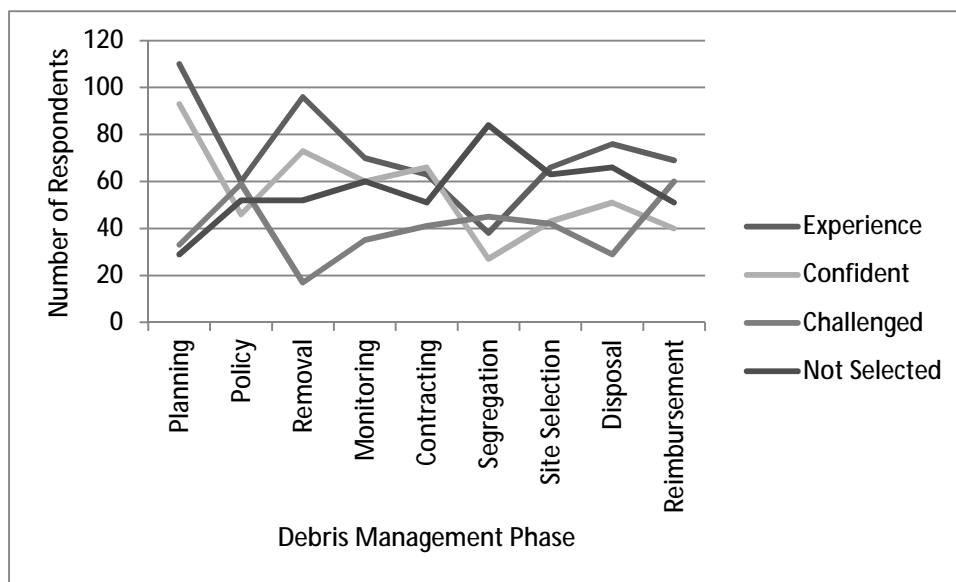


FIGURE 8: DEBRIS MANAGEMENT EXPERIENCE

Field Survey Analysis

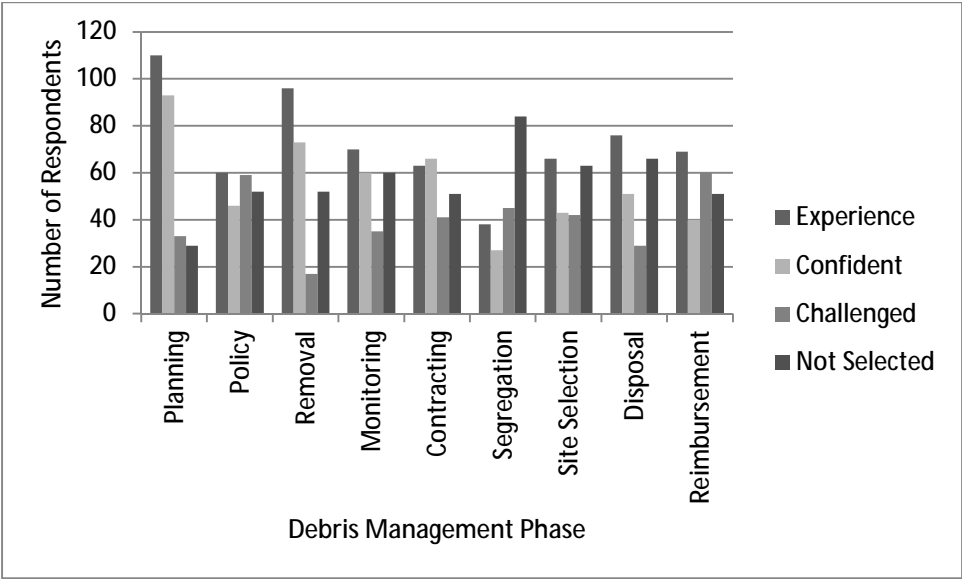


FIGURE 9: DEBRIS MANAGEMENT EXPERIENCE, ALTERNATE VIEW

APPENDIX A: FIELD SURVEY

TRB Debris Management Field Experience Survey

* Required

Your Name *

Your Title *

Your Organization *

Your State *

Your Email

Your Phone Number

What type of organization do you represent? *

- ☐ Local DOT
- ☐ Local DPW
- ☐ State DOT
- ☐ Federal Government
- ☐ Debris Management Contractor
- ☐ Other:

In your jurisdiction, what entity is responsible for debris management (planning and operations)? *

Does your organization have debris management plans? *

Field Survey Analysis

- ☐ Yes
- ☐ No
- ☐ Don't Know

If yes, please list the titles of the plans and, if available, web links to those plans
If the plans are not posted online, please indicate if we can follow up with you for copies of the plans.

Does your organization have debris management policies? *

- ☐ Yes
- ☐ No
- ☐ Don't Know

If yes, please list the titles of the plans and, if available, web links to those policies
If the policies are not posted online, please indicate if we can follow up with you for copies of the policies

Have you prepared documents that describe your field experience and lessons learned? *

- ☐ Yes
- ☐ No
- ☐ Don't Know

If yes, please list the titles of those documents and, if available, web links
If the plans are not posted online, please indicate if we can follow up with you for copies of the documents

Do you have standard, pre-positioned contracts for debris management? *

- ☐ Yes
- ☐ No

Field Survey Analysis

☐ Don't Know

If yes, please list the titles of those documents and, if available, web links

If the plans are not posted online, please indicate if we can follow up with you for copies of the documents

Have you identified debris management sites? *

- ☐ Yes, my jurisdiction owns its own debris management sites
- ☐ Yes, we have identified potential sites and have agreements in place to use them
- ☐ Yes, we have identified potential sites but do not have agreements in place to use them
- ☐ No, we have not identified specific debris management sites
- ☐ I do not represent a local jurisdiction
- ☐ Don't Know

Comments

In how many debris operations have you participated?

- ☐ None
- ☐ 1-5
- ☐ 6-10
- ☐ 11-25
- ☐ More than 25

In what areas of debris management have you participated? *

Select all that apply

- ☐ Planning
- ☐ Policy
- ☐ Removal
- ☐ Monitoring
- ☐ Contracting
- ☐ Debris Segregation
- ☐ Site Selection

Field Survey Analysis

- ☐ Disposal
- ☐ Reimbursement
- ☐ Other:

In what role or roles have you participated? *

In what debris management areas are you most confident? *

Select all that apply

- ☐ Planning
- ☐ Policy
- ☐ Removal
- ☐ Monitoring
- ☐ Contracting
- ☐ Debris Segregation
- ☐ Site Selection
- ☐ Disposal
- ☐ Reimbursement
- ☐ Other:

Comments

In what debris management areas are you most challenged? *

Select all that apply

- ☐ Planning
- ☐ Policy
- ☐ Removal
- ☐ Monitoring
- ☐ Contracting
- ☐ Debris Segregation
- ☐ Site Selection
- ☐ Disposal
- ☐ Reimbursement
- ☐ Other:

Field Survey Analysis

Comments

Please list the names of any reference documents you find useful for debris management.

Would you be willing to participate in an in-depth interview about your debris management experience?

If yes, please be sure to indicate an email address and/or phone number at which we can reach you.

- ☐ Yes
☐ Maybe--would like more information
☐ No

Do you have suggestions for other people we should survey?

Please provide names and contact information below

How did you hear about this survey? *

Select as many as apply

- ☐ APWA
☐ SWANA
☐ ICMA
☐ FEMA
☐ Other:

TRB DEBRIS MANAGEMENT HANDBOOK

CASE STUDY METHODOLOGY REPORT

JULY 14, 2013

CONTENTS

Introduction.....	1
Field Survey	1
Preliminary Interviews	2
In-Depth Interviews	2
Case Study Development.....	4
Appendix 1: Field Survey	6

Case Study Methodology Report

INTRODUCTION

A crucial part of the development of the Debris Management Handbook was the inclusion of lessons learned and best practices from the field. These were incorporated into the handbook largely as case studies, with additional "nuggets" of guidance and knowledge included in the appropriate handbook sections.

This document discusses the methodology used to collect information from experienced debris managers and develop case studies for inclusion in the Handbook.

FIELD SURVEY

The first step in the analysis of field experience was an online survey sent to state and local debris management staff. The survey was emailed to state and local representatives through the following organizations:

- Transportation Research Board (TRB) state representatives
- International City/County Management Association (ICMA)
- American Public Works Association (APWA)
- Solid Waste Association of North America (SWANA)
- International Association of Emergency Managers (IAEM)

The survey was sent out as a Google form, and survey responses were analyzed in Microsoft Excel. Survey questions were developed by Dewberry's subject matter experts with the following objectives:

1. Identify trends and the "state of the art" of debris management among state and local staff;
2. Identify additional plans and publications for inclusion in the literature review; and
3. Identify potential interviewees for expanded Case Studies to be developed.

The survey questionnaire was organized to identify:

- Documents in place in respondents' organizations, such as plans, policies, after-action reports, and pre-positioned contracts;
- Respondents' approach to identifying debris management sites;
- Level of respondents' experience; and
- Debris management areas in which respondents felt experienced, confident, and challenged.

In addition, respondents were asked to describe their field experience and whether Dewberry could follow up for an interview. The full survey is presented in [Appendix 1](#). Survey results are presented in the *Field Survey Analysis*.

Case Study Methodology Report

PRELIMINARY INTERVIEWS

Among the 166 respondents, 119 said they'd be willing to be interviewed or might be willing with additional information. Of those individuals, Dewberry identified potential interview candidates from each of the 10 FEMA regions, with the goal of identifying at least two local interviewees and two state interviewees. In some regions, there were not sufficient respondents with interest. In others, there were more than 2 local or 2 state, and interviewees were selected based on their narrative descriptions of their field experience and geographic location.

Each of the identified interviewees was asked to participate in a 30 minute telephone interview and was asked a series of qualitative questions. The questions were designed to evoke both general thoughts on the debris management cycle and specific experiences from debris management events. The interview questions were as follows:

- Do you manage debris operations? If not, who within your organization does?
- Describe your jurisdiction's most challenging debris-generating event.
- What debris management challenges did you face during that event?
- If you were going to advise a novice about debris management, what would you tell them they absolutely must do?
- If you were going to advise a novice about debris management, what would you tell them they should avoid doing?
- In your experience, what tools, information, and/or resources are critical to managing a debris operation? In other words, what can you not live without?
- In your experience, what tools, information, and/or resources would improve operations from a management standpoint? From a field operations standpoint? In other words, what would you like to have that you do not?

A total of 21 respondents were reached and willing to participate in interviews. Notes from each interview were recorded by the interviewer and shared with the Project Team. These notes are included in Appendix 2.

IN-DEPTH INTERVIEWS

At the conclusion of the preliminary interview period, the Project Team met to discuss candidates for in-depth interviews. Of the candidates identified by the project team, three were willing to participate in in-depth interviews.

Participants were asked a series of in-depth questions about their experience. The questions were designed to evoke detailed information about what worked well, what lessons were learned, and what challenges exist in the field. The interview questions were as follows:

- Ask if you can record the discussion. Ask if you can use their name in the writeup or if they prefer to remain anonymous.
- Discuss the person's background, role in the organization during "peace time", and their role in a debris operations organization. Ask about previous roles and responsibilities.

Case Study Methodology Report

- Ask about planning in general:
 - Did you have a debris management plan in place prior to the disaster event? If yes,
 1. Who was on the planning committee?
 2. How did you go about developing the plan (what process did you follow)?
 3. What other stakeholders were involved? How were responsibilities among stakeholders decided? Who was responsible for what?
 4. What issues did you face during the planning process (e.g., identifying sufficient debris management site space)? How were they resolved?
 - Did you have a pre-event debris removal and/or monitoring contract in place as part of the planning process? If yes,
 1. Which other departments/agencies were involved in developing and soliciting the contract?
 2. How many contracts were awarded?
 3. How did you determine how many contracts you needed?
 - If no, did you issue debris monitoring, removal, and/or disposal contracts? Please describe the process you followed. What contracting tips do you have to offer other agencies that might contract for debris-related services?
- Ask about the specific event:
 - Please describe the event – type, when, where it struck, how long it lasted.
 - How much debris was generated?
 - What types of debris were generated?
- If the event struck with warning (e.g., hurricane):
 - At what point did you activate your debris management plan?
 - Did you pre-position resources? If so, how many? Who/which ones? How far in advance?
 - What, if any, obstacles did you face in preparing for the event?
- Response:
 - What actions did you take immediately after the event? With which other agencies did you coordinate?
 - How many crews/personnel did you use? Were all of the resources from within your own agency? If not, where else did you find resources?
 - What hours/days did you work during response?
 - What challenges did you face during response? How did you overcome those?
 - At what point did you transition from response to recovery?
- How were expectations for public participation in the recovery process communicated to the public (e.g., how to dispose of debris, timeframes for disposing of debris, etc.)?
- Please describe the debris removal operations process your agency followed.
 - Was debris removal accomplished in accordance with your plan?
 - If you did not have a plan, how did you determine priorities and assignment of resources?
 - Who performed monitoring, removal, and disposal functions (e.g., force account labor, contract labor, MOU labor, etc.)
 - What days/hours were worked for debris removal operations?
 - What types of equipment were used and who provided them? Did you have sufficient equipment to accomplish your mission according to your schedule?
 - If you used contractors to perform any of the debris operations, what advice would you give to another agency regarding the use and management of contractors to perform debris monitoring, removal, and/or disposal?

Case Study Methodology Report

- How did you address any policy items (e.g., leaners and hangers) that arose during operations?
- Please describe the debris removal and reduction process.
 - Where was eligible debris picked up? (e.g., curbside in the right-of-way, at designated sites communicated to the public, etc.)
 - Was debris segregated? If so, by whom? Where?
 - Was debris reduced? If so, how? By whom? What, if any, special equipment was used?
 - Where was debris hauled from the pickup sites? (e.g., debris management sites, drop-off locations, or haul directly to disposal sites?)
- Please describe the disposal process.
 - Was any debris recycled? If so, which types? How much/what percentage? How was it recycled (e.g., shredded for mulch, recycled concrete, etc.)?
 - How and where was debris disposed? (e.g., recycled, disposed of at landfill, etc.)
- Please discuss any environmental or historic preservation issues that you encountered during operations and how you addressed these issues.
- Please explain how debris-related expenses were tracked.
 - Do you have a database or spreadsheet?
 - Do you use an automated debris management system or paper tickets?
 - Do you set up a separate accounting code to track disaster-related expenses?
- Please describe what types of documentation you maintained and in what format for the event (e.g., paper tickets, ADMS, photographs; database, etc.)
- Reimbursement
 - To which federal programs did you apply for reimbursement?
 - At what point in the debris management process did you begin to engage with these agencies?
 - Who prepared your grant applications? How familiar were they with the programs and application processes?
 - How long did it take for you to get reimbursed?
 - Are there any other techniques (e.g., photos, videos, etc.) that you used that you believe helped you in the reimbursement process?
- Is there additional information you wish you had gathered at the onset of response and recovery activities that would have assisted you as you moved through the response, recovery, and reimbursement application process?
- Did you conduct an after-action review of the event to evaluate performance? Did you update your debris management plan based on the outcomes of the event and the after-action review?
- Have you done anything differently in subsequent debris-generating events as a result of your experience on this event?
- Ask if there is anything else they would like to comment on.
- Tell them you will write up the case study and send them a copy for their review.

Notes and transcripts from in-depth interviews are included in Appendix 3.

CASE STUDY DEVELOPMENT

Description of methodology used to write up case studies

Case Study Methodology Report

In addition to the case studies discussed about, case studies based on the experience of the Project Team and Dewberry's subject matter experts were developed. Describe these.

Case Study Methodology Report

APPENDIX 1: FIELD SURVEY

TRB Debris Management Field Experience Survey

* Required

Your Name *

Your Title *

Your Organization *

Your State *

Your Email

Your Phone Number

What type of organization do you represent? *

- ☐ Local DOT
- ☐ Local DPW
- ☐ State DOT
- ☐ Federal Government
- ☐ Debris Management Contractor
- ☐ Other:

In your jurisdiction, what entity is responsible for debris management (planning and operations)? *

Does your organization have debris management plans? *

Case Study Methodology Report

- ☐ Yes
- ☐ No
- ☐ Don't Know

If yes, please list the titles of the plans and, if available, web links to those plans
If the plans are not posted online, please indicate if we can follow up with you for copies of the plans.

Does your organization have debris management policies? *

- ☐ Yes
- ☐ No
- ☐ Don't Know

If yes, please list the titles of the plans and, if available, web links to those policies
If the policies are not posted online, please indicate if we can follow up with you for copies of the policies

Have you prepared documents that describe your field experience and lessons learned? *

- ☐ Yes
- ☐ No
- ☐ Don't Know

If yes, please list the titles of those documents and, if available, web links
If the plans are not posted online, please indicate if we can follow up with you for copies of the documents

Do you have standard, pre-positioned contracts for debris management? *

- ☐ Yes
- ☐ No

Case Study Methodology Report

☐ Don't Know

If yes, please list the titles of those documents and, if available, web links

If the plans are not posted online, please indicate if we can follow up with you for copies of the documents

Have you identified debris management sites? *

- ☐ Yes, my jurisdiction owns its own debris management sites
- ☐ Yes, we have identified potential sites and have agreements in place to use them
- ☐ Yes, we have identified potential sites but do not have agreements in place to use them
- ☐ No, we have not identified specific debris management sites
- ☐ I do not represent a local jurisdiction
- ☐ Don't Know

Comments

In how many debris operations have you participated?

- ☐ None
- ☐ 1-5
- ☐ 6-10
- ☐ 11-25
- ☐ More than 25

In what areas of debris management have you participated? *

Select all that apply

- ☐ Planning
- ☐ Policy
- ☐ Removal
- ☐ Monitoring
- ☐ Contracting
- ☐ Debris Segregation
- ☐ Site Selection

Case Study Methodology Report

- ☐ Disposal
- ☐ Reimbursement
- ☐ Other:

In what role or roles have you participated? *

In what debris management areas are you most confident? *

Select all that apply

- ☐ Planning
- ☐ Policy
- ☐ Removal
- ☐ Monitoring
- ☐ Contracting
- ☐ Debris Segregation
- ☐ Site Selection
- ☐ Disposal
- ☐ Reimbursement
- ☐ Other:

Comments

In what debris management areas are you most challenged? *

Select all that apply

- ☐ Planning
- ☐ Policy
- ☐ Removal
- ☐ Monitoring
- ☐ Contracting
- ☐ Debris Segregation
- ☐ Site Selection
- ☐ Disposal
- ☐ Reimbursement
- ☐ Other:

Case Study Methodology Report

Comments

Please list the names of any reference documents you find useful for debris management.

Would you be willing to participate in an in-depth interview about your debris management experience?

If yes, please be sure to indicate an email address and/or phone number at which we can reach you.

- ☐ Yes
☐ Maybe--would like more information
☐ No

Do you have suggestions for other people we should survey?

Please provide names and contact information below

How did you hear about this survey? *

Select as many as apply

- ☐ APWA
☐ SWANA
☐ ICMA
☐ FEMA
☐ Other:

NCHRP TRB DEBRIS MANAGEMENT HANDBOOK

BACKGROUND REPORT: PLANNING

PREPARED BY: SHANDI TRELOAR

DESCRIPTION

The development of disaster debris management plans has been evolving over the past eight years due to new programs and policies at the Federal level. Debris planning is typically performed by the department or agency responsible for debris in a jurisdiction, such as the Department of Public Works, Solid Waste, or Transportation. However, sometimes a debris plan is written by the emergency management group within a jurisdiction, in which case its contents and strategies should be coordinated with those responsible for implementing and executing the plan.

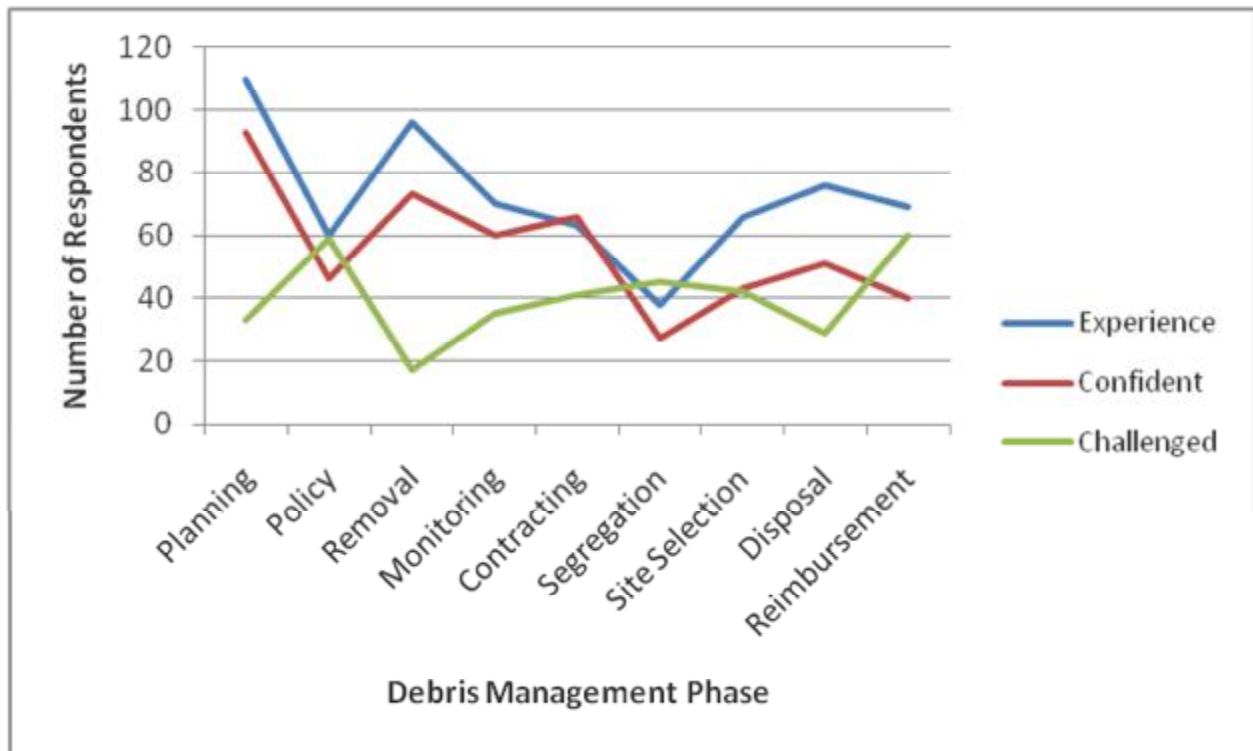
FIELD SURVEY ANALYSIS

The field survey included two questions specifically related to planning. The questions were phrased as follows:

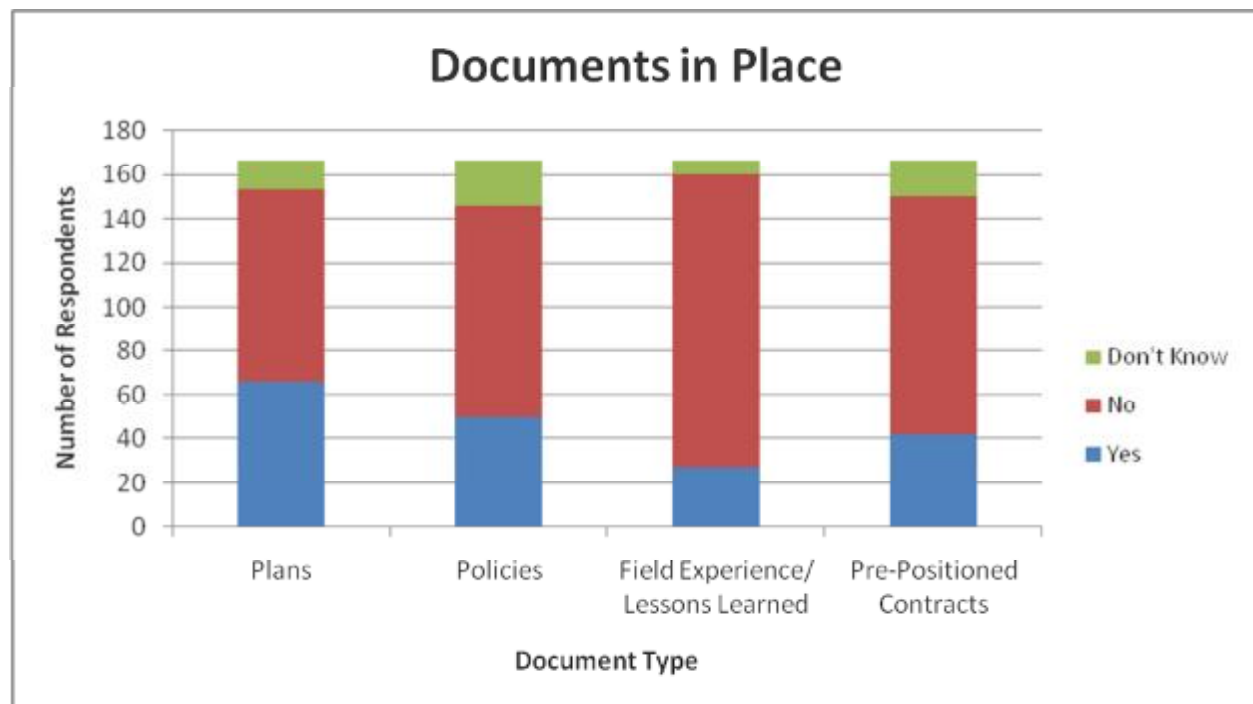
- In your jurisdiction, what entity is responsible for debris management (planning and operations)?
- Does your organization have a debris management plan?

Approximately 39% of respondents to the field survey reported having a debris management plan and approximately 7% of respondents did not know if their organization had a debris management plan. Yet 56% of respondents said they felt confident in the area of debris planning, while 21% of all respondents said they were challenged by debris planning.

Respondents were asked to identify the specific phases of the cycle in which they had experience, and then specify in which phases they felt most confident and most challenged. Planning, removal, monitoring, and contracting were areas of highest confidence; and policy, segregation, and reimbursement were the areas of greatest challenge. The figure below graphically depicts this information.



The figure below shows the distribution of respondents with debris plans, policies, lessons learned documents, and pre-positioned contracts. Note that about half of all respondents, that had plans, had them available.



DETAILED INFORMATION

WHY ARE DEBRIS PLANS IMPORTANT?

Ideally, a debris plan is a coordinating document that enables jurisdictions to establish roles and responsibilities for coordinating debris management after a debris-generating event. It prepares jurisdictions for the type and quantity of debris they should expect so they can implement procedures and criteria for administering reimbursement grant programs that are consistent with existing local, state, and federal laws. A plan establishes an operating framework, identifying key players and their responsibilities, approaches for clearing and removing debris, and strategies for disposal. It also identifies additional resources and points of coordination to facilitate a smooth, efficient operation.

WHAT IS INCLUDED IN A DEBRIS PLAN?

According to the Federal Emergency Management Agency (FEMA)'s 2007 Public Assistance (PA) Pilot Program, debris management plans should cover the elements in the following outline:

I. Staff Roles and Responsibilities

- A. Staffing Organizational Chart
- B. Roles and Responsibilities
 - 1. Staffing Assignments and Duties
 - 2. Administration
 - 3. Contracting and Procurement
 - 4. Legal
 - 5. Operations
 - 6. Engineering
- C. Emergency Communications Plan
- D. Health and Safety Plan and Procedures
- E. Training schedule

II. Situation and Assumptions

- A. Design Disaster Event
- B. Forecasted debris
 - 1. Forecasted Types
 - 2. Forecasted Locations

III. Debris Collection Plan

- A. Priorities
- B. Response Operations
- C. Recovery Operations
 - 1. Estimating staff, procedures and assignments
 - 2. Collection Method

- a. Curbside Collection
 - b. Collection Centers
- 3. Collecting Hazardous Waste and White Goods
- 4. Monitoring Staff and Assignments

IV. Debris Management Sites

- A. Site Management
 - 1. Site Manager
 - 2. Monitoring Staff and Assignments
 - 3. Safety Personnel
- B. Establishment and Operations Planning
 - 1. Permits
 - 2. Locations
 - a. Baseline Data for each location
 - b. Entry and exit for sites
 - 3. Site Layouts
 - 4. Site Preparation
 - 5. Volume Reduction Methods
 - a. Incineration
 - b. Grinding and Chipping
 - 6. Recycling
 - 7. Environmental Monitoring Program
 - 8. Site Closure

V. Contracted Services

- A. Emergency Contracting/Procurement Procedures
- B. Debris operations to be outsourced
- C. General Contract Provisions
- D. Qualification Requirements
- E. Solicitation of Contractors

VI. Private Property Demolition and Debris Removal

- A. Condemnation criteria and procedures
 - 1. Legal documentation
 - 2. Demolition permitting
 - 3. Inspections
- B. Mobile home park procedures
- C. Navigation hazard removal procedures

VII. Public Information Plan

- A. Public Information Officer
- B. Pre-scripted information
- C. Distribution plan

Appendices

- A. Maps of jurisdiction and priorities
- B. Staffing assignment maps
- C. List of Pre-qualified Contractors

- D. Load Ticket
- E. Debris Monitor Reports
- F. Truck Certification List

The Environmental Protection Agency (EPA)'s *Planning for Natural Disaster Debris* also recommends identifying and including applicable Federal, State, and local environmental regulations and ordinances that could impact debris planning and operations. The EPA also suggests that some sort of financial management plan or accounting expertise be included in a debris management plan, particularly if the jurisdiction expects to seek reimbursement through available grant programs for a significant debris-generating event.

WHEN SHOULD A DEBRIS PLAN BE WRITTEN?

Writing a debris plan during peaceful periods without incident, rather than during or right after an event, is recommended. The plan should be reviewed annually and revised as appropriate to reflect changing conditions within the jurisdiction.

WHO SHOULD BE INVOLVED IN THE PLANNING PROCESS?

The planning process should include any internal or external department, agency, or organization that would have a primary or support role in the debris operation. Some examples of agencies that are often involved in debris management plan development include but are not limited to:

- Department of Public Works;
- Department of Solid Waste;
- Office of Emergency Management;
- Electric utility providers;
- Department of Transportation;
- Water/wastewater utility providers;
- Public Information Office;
- Department of Environmental Quality; and
- Land Use/Zoning Department.

For a debris management plan to be effective, it must be approved by upper management in the organizations that are identified in the plan as supporting debris operations.

HOW IS A DEBRIS PLAN WRITTEN?

Currently, little substantive guidance on how to write a debris plan exists outside of FEMA's PA Pilot Program guidance from 2007, and uniformity of plans that were written under that program have not been evaluated. Other planning processes have clear established guidance that is outlined in documents such as the Comprehensive Planning Guide (CPG) 101 issued by FEMA. While the process outlined in CPG 101 can be followed for writing a debris plan, some specific content components have not been outlined in a clear concise guide.

Typically, a debris management plan is written by an interdisciplinary team, who establishes how the plan will be created and determines the additional parties who should provide input and feedback. Most teams meet regularly to review progress and discuss challenges that have arisen during development of the plan and how they might be resolved.

Experience has taught many officials that their debris plan should be written in a manner that allows it to be implemented regularly throughout the year during routine activities. Using this approach teaches in-house staff a method for accomplishing tasks that becomes second nature when they have to respond to a significant debris-generating event.

BEST PRACTICES

While the plan is an important component in any debris program, the process that takes place during plan development is just as critical. Having the right people involved in the process ensures a common understanding of what actions need to be taken and who has responsibility for each. As mentioned earlier, having a debris plan prior to an event is critical.

Escambia County, FL (Hurricane Ivan): Had a plan in place and stated that “time spent planning was time well spent.” The plan pre-identified contractors and sites for debris processing and removal.

LESSONS LEARNED

While the FEMA PA Pilot Program guidance is a good starting point, consistency among debris plans still varies greatly. As with other types of plans, a debris plan is often developed using a template, which limits its effectiveness as well as the process to create customized strategies for unique situations.

Palm Beach County, FL: Need to have a plan in place before the storm season. Pre-identify debris management sites, issue pre-event contracts.

San Diego County Wildfires: Not having a debris management plan in place was a major program challenge. The County believes it could have saved time and been reimbursed by FEMA more easily if a plan had been in place.

Los Angeles County, CA (Northridge Earthquake): Did not have a debris management plan in place prior to the earthquake. The County strived to recycle as much of the earthquake-generated debris as possible, so had to create a plan reactively. Los Angeles County was successful in accomplishing its recycling goal, due in part to a high level of participation and cooperation by residents.

TOOLS

FEMA PA Pilot Program Debris Planning Workshop Documents

NCHRP TRB DEBRIS MANAGEMENT HANDBOOK

BACKGROUND REPORT: POLICY

PREPARED BY: LAUREL MCGINLEY

DESCRIPTION

Policy - "A plan or course of action, as of a government, political party, or business, intended to influence and determine decisions, actions, and other matters." – The Free Dictionary

Public Policy – "A purposive and consistent course of action produced as a response to a perceived problem of a constituency, formulated by a specific political process, and adopted, implemented, and enforced by a public agency." – The Public Policy Cycle Web Site

Debris policies are generally formulated by upper-level managers, administrators, and community leaders to provide clear, specific direction for applying comprehensive rules in a uniform manner to debris management activities. Debris policies generally are the basis for evaluating if work is eligible for reimbursement through publicly funded grant programs based on compliance with legal, environmental, documentation, and other program requirements.

FIELD SURVEY ANALYSIS

The survey was emailed to State and local representatives through the following organizations (membership numbers for the organizations are shown in parentheses):

- Transportation Research Board (TRB) state representatives (50)
- International City/County Management Association (ICMA) (9,000)
- American Public Works Association (APWA) (28,600)
- Solid Waste Association of North America (SWANA) (8,000)
- International Association of Emergency Managers (IAEM) (5,000)

Total: 50,650

While most of these organizations have large membership bases, interests of their members vary, meaning a good number of their membership may not deal with debris issues. We did not anticipate a

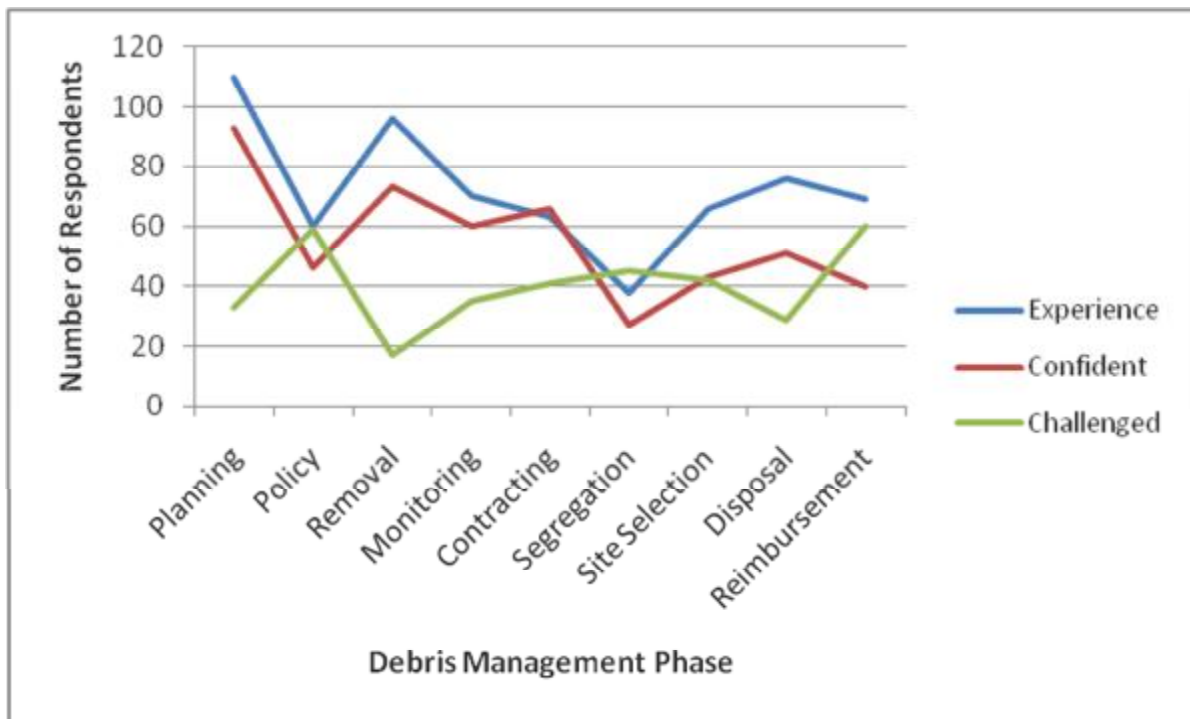
huge response rate and were pleased with the responses we received from a diverse group of respondents. A total of 166 responses were received, mostly representing local governments.

The field survey included four questions about debris policies:

1. In what areas of debris management are you most confident?
2. In what areas of debris management are you most challenged?
3. Does your organization have debris management policies?
4. If yes, please list the titles of the plans and, if available, web links to those policies.

As of September 19, 2012, responses to the survey indicated the following:

- Policy was one of the areas of least confidence that respondents had about the debris management process; only 20 respondents (approximately 26%) felt confident about their knowledge and understanding of debris policy, while 38 (approximately 36%) felt challenged by it.
- Forty-five survey respondents (approximately 31%) indicated that their organization has debris management policies. The vast majority indicated that the policies are incorporated into their plans. The identified documents include:
 - Emergency Operations Plan (EOP) (most at the local level, some follow the State plan)
 - Standard Operating Procedure (SOP)
 - Debris Management Contract Specification
 - Debris Management Inspection Services Contract Specification
 - Debris Management Plan (most at local level, some follow the State plan)
 - Hurricane Plan
 - Connecticut Department of Energy and Environmental Protection (CT DEEP)
 - Landfill operations plan
 - Debris right-of-way removal policy
 - Federal Highway Administration (FHWA) Emergency Relief (ER) program policies (will change as a result of approved Moving Ahead for Progress in the 21st Century Act (MAP-21 Transportation Bill))
- 83 respondents (approximately 58%) indicated that their organization does not have debris management policies. One respondent indicated that they are in the process of developing policies.
- 16 respondents (approximately 11%) do not know if their organization has debris management policies.
- When asked if a copy of their debris management policies were available in hard copy or online, the majority of respondents referred us to their debris management plans. This leads us to believe that either the policies are incorporated into the plans or that plans and policies are considered interchangeable.



DETAILED INFORMATION

WHY ARE POLICIES IN PLACE?

Written debris policies enable government agencies to implement consistent criteria and procedures for administering reimbursement grant programs. In accordance with existing local, State, and Federal laws and regulations, some policies protect public health and welfare, the environment, private or public property, and other issues. The policies might also help clarify the intent of the law. For example, the Federal Emergency Management Agency (FEMA) has published the Public Assistance Guide, Policy Digest, and 9500 Series Policy Publications to explain and clarify parts of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. States and local governments sometimes issue their own policies to supplement other program policies and requirements to achieve a specific goal.

WHAT DO POLICIES DETERMINE?

Debris management policies govern eligibility requirements for the programs, and therefore affect how planning and operations are implemented. Policies can address any or all aspects of the debris management cycle. They can determine who is eligible to apply for funding, which activities are appropriate for funding and which are not, how contracting should be accomplished, how materials are to be handled and transported, how and where materials can be disposed of, the basis for reimbursement, how measurements are taken, documentation required for reimbursement, and

requirements for closeout and auditing of program activities. They can be implemented at the Federal, State, and/or local level.

For example, FEMA's Public Assistance (PA) program has a number of debris management policies. The Public Assistance Guide provides the general policy covering reimbursement eligibility for debris-related activities. A number of policies issued as part of the 9500 Series Policy Publications further address specific issues related to debris activities, such as:

- Removing debris from private property;
- Hazardous stump extraction and removal eligibility;
- Debris removal from waterways;
- Debris operations – hand-loaded trucks and trailers;
- Fact sheet: debris contracting guidance;
- Fact sheet: debris removal authorities of other Federal agencies;
- Fact sheet: debris monitoring; and
- Documenting and validating hazardous trees, limbs, and stumps.

Similarly, FHWA's ER program also has policies that address eligibility of emergency and damage repair work. These policies define what is considered "emergency repair" work, debris and timber included in the program, timelines for accomplishing the work, and limits for clearing and hauling.

Many State and local governments enact additional debris management policies to achieve other objectives, such as maintaining consistency with State environmental regulations or reducing the amount of landfill space that disaster debris occupies. For example, State and local debris recycling policies may prescribe what types of disaster debris should be segregated and recycled to be consistent with other existing solid waste recycling policies.

WHEN ARE POLICIES ENACTED?

In general, policies are developed and issued when there is a perception of a need or gap requiring clarification. Initial policies are formed as the program is established to create a framework for eligibility. Additional policies might be issued to clarify ambiguities or information missing from the existing policy, or to address common circumstances that could occur during a disaster. Supplemental policies might also reflect changes in State or local laws, or the findings of a program eligibility appeal. Additional and supplemental policies can be established before, during, or after a disaster.

WHO ENACTS POLICY?

Program Administrators, State and Local Department Administrators, and other high-level managers typically issue policies. Legal counsel, financial administrators, policy analysts, and politicians are other parties that might be included during policy development. .

Entities that are regulated by Federal debris management policies are eligible applicants. These parties must adhere to the policy requirements to be eligible for reimbursement through the programs. Other entities that are involved in the debris management process, such as haulers, monitors, and owners/operators of disposal sites should also comply with the Federal program policies. However, the

applicant has the legal responsibility to ensure that these parties comply with the debris management policies. For policies enacted at the State and local level, each entity involved with an aspect of the debris management cycle is likely to be subject to compliance with those State and local policies.

HOW ARE POLICIES DEVELOPED AND ISSUED?

The list below outlines a general process and some considerations for developing and issuing policies. Additional, more detailed information can be found on a number of websites about public policy development.

- Designate an organization and individual to be responsible for creating the policy and championing its implementation.
- Define the problem – the issue, gap, or inconsistency to be addressed.
- Gather data.
 - Delegate research, information collection, and writing assignments.
 - Create a schedule.
- Synthesize and analyze data; develop options.
- Evaluate options, including the current policy (no change) option. Consider legislative, judicial, financial, and administrative requirements to implement each option. Identify expected outcomes. How well does the option address the issue? How quickly can it be implemented? What are the potential adverse impacts? Is the proposed policy consistent with existing policies and laws?
- Consult with any parties who could be affected by the proposed policy, and seek their feedback and input. Determine how to contact these parties (for example, through workshops and public meetings), and when to begin and end the consultation process. Generally it is advised to start the consultation process internally within the organization.
- Select the best option; write a document explaining the need, describing the solution, and outlining its implementation.
- Determine who within senior leadership will sign and champion the policy.
- Identify financial and staffing resources that will be required to implement the policy.
- Develop a communication strategy and communicate the policy to stakeholders.
- Monitor policy implementation.

BEST PRACTICES

State of Louisiana EOP, Louisiana Department of Transportation and Development (DOTD) Debris Management Plan, Louisiana Department of Environmental Quality (LA DEQ) Disaster Clean-Up and Debris Management; Re-Thinking Debris The Industry: Construction and Demolition; Monterey Regional Waste Management District – Katrina Response Waste Processing Priorities; Hawaii Disaster Debris Management Plan Best Practices Annex.

Validity and appropriateness of best practices to be identified for inclusion in the handbook as it's developed.

LESSONS LEARNED

Response to the 2011 Joplin, MO Tornado; LA DEQ Disaster Clean-Up and Debris Management; A Case History Study of the Recycling Efforts from the United States Army Corps of Engineers (USACE) Hurricane Katrina Debris Removal Mission in MS; Hurricane Katrina Disaster Debris Management: Lessons Learned from State and Local Governments.

Validity and appropriateness of lessons learned to be identified for inclusion in the handbook as it's developed.

TOOLS

Policy fact sheets and guidance from FEMA, State, and local governments

NCHRP TRB DEBRIS MANAGEMENT HANDBOOK

BACKGROUND REPORT: CONTRACTING

PREPARED BY: LAUREL MCGINLEY

DESCRIPTION

If a local or State agency responsible for overseeing debris operations in a federally declared disaster plans to request reimbursement from Federal agencies for the cost of debris removal or oversight work, that agency must follow Federal procurement regulations as well as their own agency procurement requirements when issuing contracts to companies to perform debris removal and related functions. Contracts can be awarded pre-event or post-event. Post-event contracts can be issued on an emergency, short-term basis or for long-term work. Federal procurement laws and agencies limit the types of cost contracts that can be awarded; for debris operations, cost-plus-a-percentage-of-cost contracts are not permitted, and time-and-materials contracts are also discouraged. Having a solid understanding of Federal contracting requirements for debris operations will enable an agency to be eligible to request reimbursement of costs at the Federal cost share level, decreasing the financial burden on the disaster-impacted community.

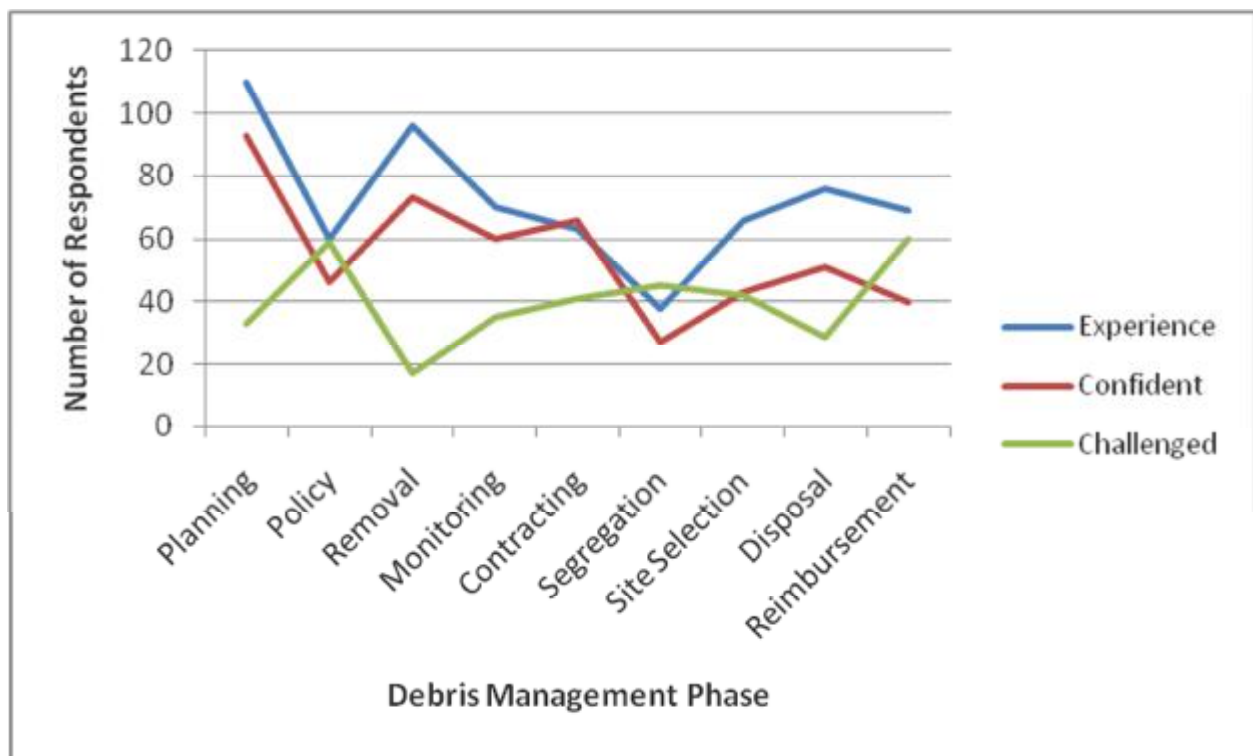
FIELD SURVEY ANALYSIS

The field survey included four questions about debris contracting:

1. In what areas of debris management are you most confident?
2. In what areas of debris management are you most challenged?
3. Do you have standard, pre-positioned contracts for debris management?
4. If yes, please list the titles of those documents and, if available, web links.

As of September 19, 2012, 58 of the 144 survey respondents, or 40%, indicated that they felt confident about their debris contracting capabilities, while only 30 respondents, or 20.8%, felt challenged by the task. Only 39 of the respondents, or 27%, indicated that they have standard, pre-positioned contracts for debris activities, while the vast majority, 89 respondents or 61.8%, do not have pre-positioned contracts, and 16 or 11.1% did not know if their agency has pre-positioned debris contracts. Most of the respondents who indicated that they have pre-positioned contracts said that the contracts are proprietary and/or in hard copy format only, but that copies could be provided upon request. Of those who do not have pre-positioned contracts or did not know of their availability, the following comments applied:

- Two respondents use a regional contract established by a Council of Governments or Regional Planning Committee.
- Three respondents are in the process of drafting pre-event contracts.
- One respondent has draft contracts that could be completed and executed if needed.
- One respondent indicated that they have copies of previous debris contracts and would use similar language if they need to issue another debris contract.
- In one case, the State has developed boilerplate language and posted it on the internet for use by local jurisdictions.
- Two respondents indicated that the local or State General Services Administration has responsibility for administering these types of contracts.
- One State has laws that give property rights for trash and debris to currently contracted haulers by geography.
- One jurisdiction will rely on the U.S. Army Corps of Engineers to provide debris removal services after a federally-declared disaster.
- One jurisdiction has entered into a verbal agreement with a contractor, but the contractor will not sign a pre-event contract.



DETAILED INFORMATION

WHY IS CONTRACTING IMPORTANT?

After a significant debris-generating event, many State and local agencies that have primary responsibility for debris management do not have sufficient resources to support debris activities while continuing to provide their usual services to the community. While residents might tolerate decreased levels of service for short periods, debris management activities can take months to accomplish, necessitating the augmentation of existing staff and capabilities so that the agency can continue to provide the expected level of service to its citizens. Most State and local agencies augment their capabilities by contracting with outside providers for debris removal and monitoring services.

Federal agencies that have primary oversight of reimbursement programs for roadway debris management are the Federal Highway Administration (FHWA) and the Federal Emergency Management Agency (FEMA). Because ultimately Federal funds will be used to pay for most of the debris management activities, State and local agencies issuing the contracts must meet Federal contracting requirements. State and local agencies that fail to meet these requirements will not be eligible for partial reimbursement of the costs incurred for debris removal, disposal, monitoring, or other related activities, and thus will have to absorb these costs into their existing budgets.

WHAT IS INVOLVED IN CONTRACTING?

All Federal agencies that administer reimbursement grant programs for disasters require State and local entities to follow Federal procurement regulations. In general, they strongly advocate the use of pre-event contracting to promote competitive bidding procedures, which presumably allows the entity to obtain lower bids than they might when demand is high and resources are scarce, as is typical immediately after a disaster. Verbal agreements generally are non-binding and are not recognized by Federal agencies for the purposes of reimbursement; contracts should be in writing. Federal agencies that administer disaster-related programs include:

- FEMA – Public Assistance (PA) program
- FHWA – Emergency Relief (ER) program
- National Resources Conservation Service (NRCS) – Emergency Watershed Protection (EWP) program

In addition to following Federal procurement regulations, State and local agencies that issue debris management contracts must follow procurement requirements pertaining to each agency's disaster debris program. Generally, Federal agency programs require that debris management contracts be competitively bid. There are provisions in some Federal programs that allow for limited use of non-competitively bid contracts so that post-event roadway clearance can begin immediately to allow fire, police, and other emergency responders access to perform life-saving activities. However, these programs strongly encourage the use of competitively bid, pre-event contracts to perform immediate post-disaster work, and require the use of competitively bid contracts for long-term debris management activities.

The programs can differ in several respects depending on what methods of contracting are allowable. The FHWA ER program defines “emergency repairs” as “repairs made during and immediately following a disaster to restore essential traffic, to minimize the extent of damage, or to protect the remaining facilities.” Emergency repairs in the FHWA ER program must be made within the first 180 days following the disaster. The FHWA ER program permits the use of the following types of contracts:

- Competitively bid contracts;
- Negotiated equipment rental contracts;
- Negotiated debris management contracts; and
- Solicited contracts whereby an agency solicits telephone quotes from a “reasonable minimum number of contractors.”

While competitively bid contracts are strongly preferred, the latter three types of contracts are permitted when the State determines that competitive bidding is not effective or feasible. Under these circumstances, the State must determine whether the price of the negotiated contract is reasonable and conduct a cost analysis prior to award whenever practicable to ensure that prices are fair and reasonable. For all other situations, Federal procurement guidelines must be met for work to be eligible for reimbursement under the program.

The FHWA ER program requires the inclusion of FHWA Form 1273 in all contracts and prohibits the award of contracts to debarred contractors.

The Department of Interior’s Bureau of Indian Affairs (BIA) has designated some roads on tribal lands as falling under the authority of the FHWA, and therefore these roads may be subject to the same contracting requirements as those described above. In addition, according to a memorandum of understanding between the FHWA and the BIA, the contracts might also be subject to provisions in the law giving preference to Native Americans in minority businesses, preference to Native American subcontractors and workers, and training and assistance to minority contractors.

The FEMA PA program also strongly advocates the use of competitively bid contracts. However, depending upon circumstances, the following types of contracts might be considered for reimbursement:

- Small purchase orders to secure services or supplies costing less than \$100,000 by obtaining several price quotes from different sources;
- Sealed bids wherein the contract is awarded based on price (preferred method);
- Competitive proposals wherein the contract is awarded based on contractor qualifications; and
- Noncompetitive proposals, used only if the other three methods are not feasible and the item is available from a single source, there is an emergency that does not permit delay, or competition has been determined to be inadequate. Non-competitive proposals must be supported by a cost analysis completed by the procuring agency.

In addition to meeting the competition requirements for contracts, FEMA requires use of one of the four following reimbursement types of contracts:

- Lump sum for contracts with a clearly defined scope of work and total price;
- Unit price for work done on an item-by-item basis with an established cost per item;

- Cost-plus-fixed-fee, which can be either lump sum or unit price contracts with a fixed contractor fee added to the price; or
- Not-to-exceed time-and-materials, where the contractor bills for labor, equipment, materials, and overhead up to a prescribed maximum amount. FEMA will reimburse for only 70 hours of work performed under a time-and-materials contract. Further, the agency awarding the contract must monitor and provide documentation of contractor expenses and coordinate with the State to ensure proper guidelines are followed.

FEMA discourages the use of so-called “piggyback contracts” wherein a public contracting entity that was not part of the original requesting agency procures goods or services through the use of another public entity’s award of a competitively bid contract.

FEMA prohibits the use of:

- Cost-plus-percentage-of-cost contracts; and
- Debarred contractors.

The NRCS has five methods of contracting for EWP projects:

- *Federal contract* – NRCS enters into an agreement with the Project Sponsor to do the contracting. Federal Acquisition Regulations, United States Department of Agriculture Acquisition Regulations, and NRCS Acquisition Regulations are followed. Projects costing less than \$100,000 can use the Simplified Acquisition Process. Projects costing more than \$100,000 must use competitive bidding procedures.
- *Locally-led contracting* – This is the preferred method of contracting for the EWP. The sponsor contracts for the work using the appropriate State and local regulations.
- *Force account* – The sponsor uses its own personnel and equipment to accomplish the work. This method can be used only for projects with an estimated cost of \$150,000 or less.
- *Locally-led with landowner contract* – The sponsor enters into a contract with the landowner to accomplish the approved scope of work.
- *Performance of work* – This method is used when the sponsor does not have funds available to pay for its share of the installation work or the accounting system needed to keep detailed records required by force account contracting, but has forces (in-house or donated) to perform the work. In this case, the agreed-to price between the sponsor and NRCS is fixed prior to commencement of the work, and recordkeeping is not required.

For all programs, the scope of work included in the contract should refer to “eligible work” under the regulations, policies, and guidance that govern each program. The scope of work should also identify the extents and limits of where work is to be performed, for example, in “public rights of way” or on “public property” as prescribed by the particular program.

Federal procurement regulations should be followed regarding inclusion of standard clauses for reasons such as invoicing requirements, payment terms, termination for cause, termination for convenience, and bonding requirements, among others.

In addition to adhering to all Federal procurement requirements that govern the highway-related debris reimbursement programs, contracts must specify the basis of payment for services. Typically, debris

management contracts are paid on either a volume (cubic yards) or weight (tons) basis. The basis of payment and method of documentation and verification should be clearly articulated in the contract.

WHEN SHOULD CONTRACTING OCCUR?

Federal agencies involved with reimbursing State and local agencies for costs associated with debris management activities strongly advocate the use of pre-event contracting. The use of pre-event contracts allows State and local agencies to comply with their own procurement requirements as well as those at the Federal level, ensuring that competitively bid contracts are awarded to qualified firms at fair prices.

If contracting must occur after a debris-generating event, it should take place as quickly as possible to permit life-saving activities, but also ensure that longer-term operations will be reimbursable according to the requirements of the governing Federal reimbursement programs. As discussed previously, several contracting methods are permitted in the short term immediately after an event. These contracts allow emergency operations to commence while longer term contracts are awarded through more traditional and federally accepted means.

WHO IS INVOLVED IN CONTRACTING?

Each State and local government agency responsible for overseeing debris management operates under different hierarchical structures within their governments. The following entities could be involved in contracting for debris management services, depending on the government structure of their particular jurisdiction:

- State or local department of transportation and highways
- State or local general services administration or equivalent contracting agency
- Regional coordinating entity such as a council of governments or regional planning committee
- Local department of public works
- Local utility department
- Local emergency management agency
- Local parks department
- Local department of natural resources

Within the locality or agency, different individuals could participate in development, award, oversight, and payment of the contract. Such individuals could include, but are not limited to:

- City/County Manager
- Department Administrator (e.g., Director, Deputy Director)
- Division Administrator (e.g., Solid Waste, Streets)
- Contracting Officer/Contracting Specialist
- Procurement Manager
- Finance Officer

HOW TO ISSUE A DEBRIS MANAGEMENT CONTRACT

As stated previously, pre-event contracting is the method preferred by Federal agencies that oversee debris management reimbursement programs. Entities that are considering procuring pre-event debris management contracts should consider the following:

- Review the entity's debris management plan to understand the types and quantities of debris that are likely to be generated by a given event, as well as potential locations for staging and disposal.
- Determine how many contracts will be awarded.
- Develop an appropriate scope of work.

Parties that will be involved in oversight of the work should be included or represented during the contracting process.

All of the entity's own procurement regulations as well as applicable Federal requirements should be followed when issuing the request for proposals, evaluating the proposals, and negotiating and awarding the contract(s).

BEST PRACTICES

From Hurricane Katrina – Louisiana Department of Environmental Quality (DEQ) and/or Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP).

Validity and appropriateness of best practices to be identified for inclusion in the handbook as it's developed.

LESSONS LEARNED

Validity and appropriateness of lessons learned to be identified for inclusion in the handbook as it's developed.

TOOLS

LA DEQ, FL Department of Transportation (DOT), FEMA Debris Handbook, Sample Debris Management Plans, Sample contracts/boilerplate and scope of work language

NCHRP TRB DEBRIS MANAGEMENT HANDBOOK

BACKGROUND REPORT: REMOVAL

PREPARED BY: JULIA MOLINE

DESCRIPTION

Debris removal refers to the actions required to get post-disaster debris out of roads, off public and private property, and out of waterways. The process typically begins immediately after a disaster occurs, and can continue for days, weeks, and even months. Debris removal can involve the cooperation of various public agencies as well as contractors.

FIELD SURVEY ANALYSIS

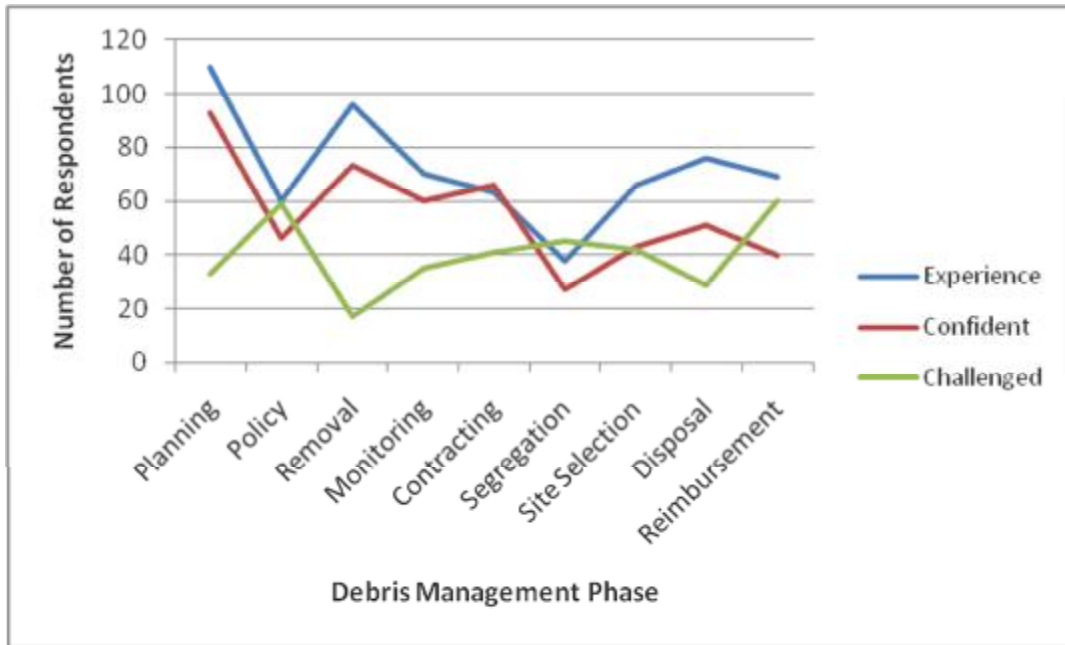
The survey was emailed to State and local representatives through the following organizations (membership numbers for the organizations are shown in parentheses):

- Transportation Research Board (TRB) state representatives (50)
- International City/County Management Association (ICMA) (9,000)
- American Public Works Association (APWA) (28,600)
- Solid Waste Association of North America (SWANA) (8,000)
- International Association of Emergency Managers (IAEM) (5,000)

Total: 50,650

While most of these organizations have large membership bases, interests of their members vary, meaning a good number of their membership may not deal with debris issues. We did not anticipate a huge response rate and were pleased with the responses we received from a diverse group of respondents. A total of 166 responses were received, mostly representing local governments.

Approximately 60% of the 166 respondents to the field survey reported previous experience with debris removal. Forty-one percent of all survey participants said they were confident in the area of debris removal, and less than 10% said they were challenged in this area.



DETAILED INFORMATION

WHY IS REMOVAL IMPORTANT?

Prompt removal of debris after a disaster minimizes the threat to life, public health, and safety. Debris clearance immediately following an event allows lifesaving operations to occur by creating a pathway for emergency vehicles to access blocked routes and geographic areas. In the event that debris is deposited in waterways, its removal is important to prevent flooding of the surrounding area and remove potential sources of contamination.

Debris removal from public rights-of-way and public property allows daily activities to resume and government services that are expected by the public to continue. Ultimately, these activities lead to economic recovery of the community.

WHAT IS REMOVAL?

Implementing an effective, efficient debris operation depends in part on developing a clearance and removal strategy in advance of a debris-generating event. Debris strategies typically include two main phases: emergency roadway debris clearance and debris removal from public spaces. Debris strategies should consider coordination needs with other agencies as well as Federal grant reimbursement program eligibility requirements.

Phase I: Debris clearance occurs during the first 24 to 72 hours after a disaster, and involves pushing debris to the edge of the right-of-way to create access for emergency vehicles to impeded areas, rather than restoring roads to pre-event conditions. The designated debris manager and staff should identify in advance which routes are essential to emergency operations. This will allow them to direct local efforts and target areas for possible State and Federal assistance. The designated debris manager and staff also should be aware of local, tribal and State agency capabilities to provide service for emergency roadway debris clearance. Available resources should include the following:

- Municipal force account workers and equipment
- Local, tribal and State Department of Transportation workers and equipment;
- National Guard
- Local contractors hired by local and tribal governments

If an event occurs with warning, the jurisdiction should disperse vehicles throughout the area to minimize the risk of vehicle damage as well as prepare for clearance and removal operations.

Following a disaster, a top priority is to clear major arterial roads, including those leading to health care facilities. Phase I activities also include identifying and removing any obvious debris situations that may pose an immediate threat to public health and safety (e.g., dangerously positioned, damaged trees; debris piles that obstruct traffic visibility; and fire-prone debris piles). Debris clearance should be closely coordinated with utility activities to expedite removal of material affecting the restoration of services.

Phase II: The recovery phase focuses on collecting the remaining debris, reducing or recycling, and final disposal. As clearance and removal efforts progress, the public rights-of-way and initial roadside debris

piles will become a primary dumping location for affected citizens, particularly for additional yard waste and other storm-generated debris. As a result, expedient removal of debris from in front of residents' homes should become a priority to clear public rights-of-way and expedite the return of key utilities.

Costs of removal operations may be reimbursed by Federal agencies if the debris is eligible according to the regulations of the particular grant program. A few examples of individual program eligibility follow:

- Federal Highway Administration (FHWA) Emergency Relief (ER) Program – Emergency repairs may be eligible for reimbursement under the ER program. Debris removal is considered emergency repair only to the extent that it is needed to minimize damage, protect facilities, or restore essential traffic.
- Public Assistance (PA) funds are available to eligible applicants for debris clearance, removal, and disposal operations. Eligible applicants include State and local governments, Native American tribes, and certain private nonprofit organizations. To be eligible for Federal Emergency Management Agency (FEMA) funding, the debris removal work must:
 - Be a direct result of a Presidentially declared disaster
 - Occur within the designated disaster area
 - Be the responsibility of the applicant at the time of the disaster

In addition, debris removal work must be necessary to:

- Eliminate an immediate threat to lives, public health, and safety
- Eliminate immediate threats of significant damage to improved public or private property
- Ensure the economic recovery of the affected community to the benefit of the community at large

Public property: Typically, costs for removing debris from land are eligible for reimbursement only if the debris is located on public property or is in the right-of-way of a publicly maintained street. Eligible debris may include the following: disaster-related vegetative materials, construction and demolition materials, and household goods. It may also include other materials deposited on public property or rights-of-way (by an event or a property owner) and debris that present an immediate health and safety threat.

Private property: Debris removal from private property is generally not eligible for Federal grant funding because it is the responsibility of the individual property owner. If property owners move the disaster-related debris to a public right-of-way, the local government may be reimbursed by FEMA for curbside pickup and disposal for a limited period of time. The FHWA ER program will not reimburse for this type of debris removal. If the debris on private business and residential property threatens the public health, safety, or economic recovery of the community, FEMA may fund debris removal from private property, but it must be approved in advance by the Agency. The demolition of unsafe privately owned structures and removal of resulting debris may be eligible when the following conditions are met:

- The structures were damaged and made unsafe by the declared disaster, and are located in the area of the disaster declaration

- The applicant certifies that the structures are determined to be unsafe and pose an immediate threat to the public
- The applicant has demonstrated that it has legal responsibility to perform the demolition;
- A legally authorized official has ordered the demolition of unsafe structures and removal of demolition debris
- The applicant has indemnified the Federal government and its employees, agents, and contractors from any claims arising from the demolition work
- The demolition work is completed within the deadlines specified in 44 CFR 206.204 for emergency work

The Federal Coordinating Officer (FCO) determines if and under what circumstances the costs of debris removal from private property are reimbursed. In addition to the demolition of a residence, eligible costs could also include capping wells; pumping and capping septic tanks; filling in basements and swimming pools; testing and removing hazardous materials; securing utilities; securing permits, licenses, and title searches; and demolition of outbuildings.

If the FCO determines that debris removal from private property is eligible for reimbursement by FEMA, State and local government officials may need to enter private property to demolish structures made unsafe by disasters, and eliminate immediate threats to life, public health, and safety. These agencies should try to obtain rights-of-entry and hold harmless agreements from the property owners before proceeding with demolition. If the homeowner cannot be found within a reasonable amount of time to sign these documents, the State or local government should confirm that a legally authorized official has ordered the exercise of public emergency powers to enter a private property. FEMA also requires that the State or local government indemnify the Federal government from any claims against it related to the demolition of private property. Decisions about private property right of entry should be made during the debris management planning phase to promote efficient operations during recovery from an actual event. After Hurricane Katrina, local governments did not have resources to coordinate a multi-stage process involving FEMA, the U.S. Army Corps of Engineers (USACE), and property owners to make determinations about whether private property should be demolished. This lack of a coordinated effort had the greatest impact on the duration of the debris removal operation.

In addition to obtaining or demonstrating the legal right to enter private property, the State or local government should also coordinate with environmental and historic preservation personnel to ensure that relevant requirements are met before, during, and after demolition.

When demolition of private structures is covered by an insurance policy, the insurance proceeds are used as the first source of funding, and PA can pay the remainder. If other funding is obligated, FEMA can deobligate PA funds.

Marine debris: USACE has primary responsibility in federally maintained navigable waterways, while the United States Coast Guard is required to remove debris from coastal zones. FEMA funds some removal operations if the debris results from a disaster, removal is in the public interest, and another agency does not already have specific authority for the activity. FEMA makes an eligibility (public interest) determination based on the type of waterway and the nature of the hazard and debris.

Types of debris: Debris should be segregated by type as much as possible at the curbside before removal to a debris management or disposal site. Segregated debris should be removed and

transported to the appropriate location on the debris management or disposal site. Removal of some types of debris might require special handling; all local, State, and Federal ordinances and regulations regarding specific waste types should be followed. If debris is not segregated at the curbside, it may be transported as mixed debris and segregated at the debris management site. Types of debris include the following:

- Vegetative
- Construction and Demolition (C&D)
- Hazardous waste (household or industrial)
- White goods, such as appliances
- Soil, mud, and sand
- Vehicles and vessels
- Putrescent debris, such as food that can decompose
- Infectious waste
- Chemical, Biological, Radiological, and Nuclear (CBRN)-contaminated; and
- Garbage (municipal solid waste)

For additional information about segregation and waste types, see the Segregation Background Report.

WHEN IS REMOVAL DONE?

Debris clearance usually starts within 24 to 72 hours after a disaster occurs and lasts for 24 to 72 hours, although the actual duration depends on the magnitude of the disaster and available resources, such as the number of personnel and type of equipment. Debris removal starts after clearance, usually 24 to 72 hours after the event, and can last days, weeks, months, or even years in the case of catastrophic events.

Debris removal operations typically occur in daylight hours, although some operations will use large, portable floodlights if the debris operations manager determines that doing so is appropriate to meet objectives. Shifts usually last 10 to 14 hours.

WHO IS INVOLVED IN REMOVAL?

Clearance and removal operations may involve only a few agencies or many players, depending on the magnitude of the event and the nature and location of the debris. During the clearance phase, coordination should occur among entities to ensure an efficient, effective operation that promotes lifesaving activities:

- Local jurisdiction force account labor and equipment (typically Public Works and Solid Waste departments)
- Emergency services agencies (e.g., police, fire, emergency medical services)
- Utility providers (especially electric utilities if there are downed power lines)
- Local and State emergency management agencies
- Debris contractors

As clearance evolves to removal, more agencies are likely to become involved in debris removal operations. The local Public Works or Solid Waste department is likely to have primary responsibility for overseeing debris removal operations. Some additional agencies that might be involved include:

- State agencies
 - Department of Agriculture – Disposal of carcasses and spoiled crops, use of recycled materials (e.g., organic fertilizer)
 - Department of Environmental Quality – Permits, environmental compliance
 - Department of Forestry – Assistance with clearance and removal, recycling vegetative debris
 - Department of Health and Human Services – Disposal of carcasses, putrescent and infectious waste
 - Department of Natural Resources – Guidance and fact sheets, permits, recycled materials uses
 - Department of Transportation – Removal from Federal aid roads, hauling permits
- Federal agencies
 - Department of Agriculture – Assistance with debris removal
 - Department Of Energy – Management of nuclear contaminated debris
 - Department of Health and Human Services – Support of contaminated debris management activities
 - Department of Interior
 - § Bureau of Indian Affairs – Debris removal from Native American lands
 - § Bureau of Reclamation – Assistance with debris clearance and monitoring
 - Department of Labor – Advice on worker safety from the Occupational Safety and Health Administration
 - Department of Transportation – Assistance with debris clearance and removal;
 - Federal Emergency Management Agency – Public Assistance program implementation and oversight
 - Federal Highway Works Administration – Emergency Relief program implementation and oversight
 - Natural Resources Conservation Service – Emergency Watershed Protection program implementation and oversight
 - Nuclear Regulatory Commission – Assistance with and advice on radiologically contaminated debris
 - U.S. Army Corps of Engineers – Primary responsibility for Emergency Support Function ESF #3 under the National Recovery Framework, which includes debris; Debris removal operations
 - U.S. Coast Guard – Vessel salvage and vessel debris removal, debris removal operations in the Coastal Zone
 - U.S. Environmental Protection Agency – Environmental compliance and guidance, waste sampling, hazardous waste removal (per ESF #10), recycling and reuse opportunities, coordination on Weapons of Mass Destruction-type contaminated debris management

HOW IS REMOVAL DONE?

Debris removal operations tend to be fairly labor-intensive, requiring operators for the equipment used to accomplish removal, drivers of the vehicles to haul the debris, people to segregate debris, and personnel to monitor removal operations. To accomplish debris removal efficiently, the debris manager determines collection methods and hauling approaches.

Typically, one of two types of collection systems is used: curbside or collection centers. Curbside collection is commonly used after a disaster and involves placing disaster-generated debris in the public rights-of-way or on public property for collection. Collection centers require residents to transport their debris to a common location and drop it off. This latter method is more common in rural areas or where curbside collection is not practical. The identification of a debris collection method should also consider the following criteria:

- Amount of debris generated
- Type of debris
- Urgency of site clearance
- Disaster site characteristics
- Debris recycling possibilities
- Geographic complications

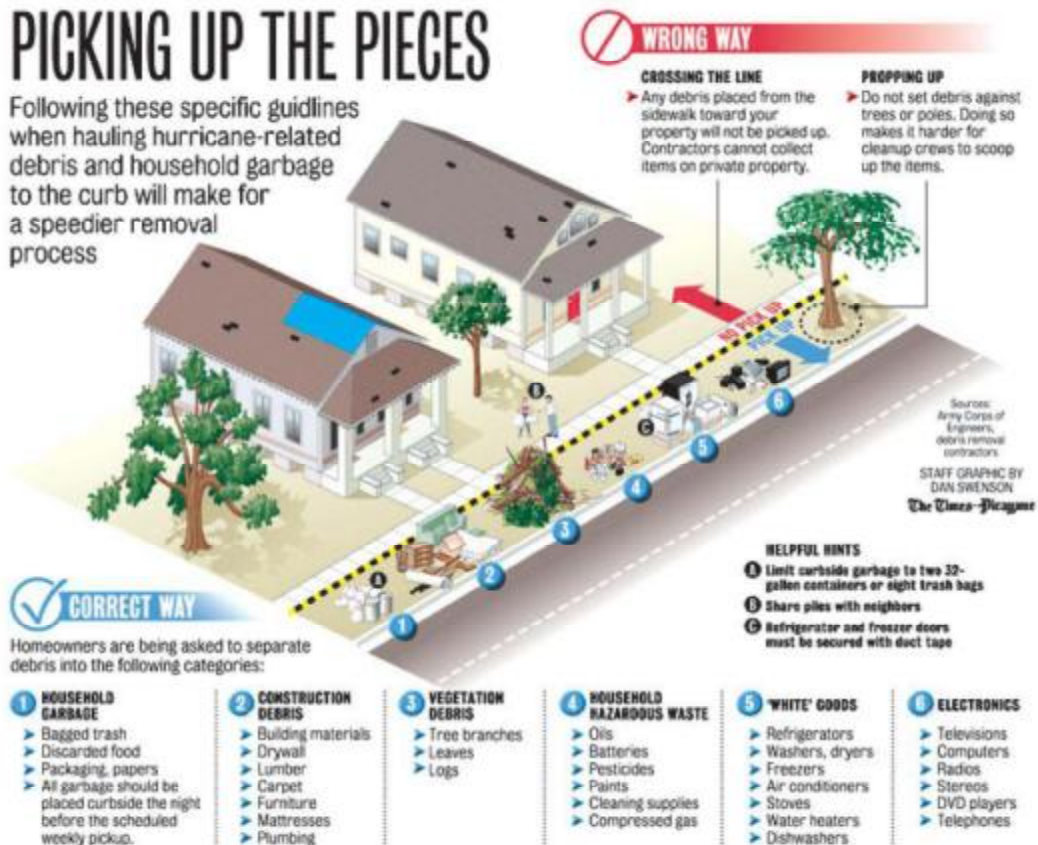
The types of equipment used in debris removal operations may include the following: dump trucks, bucket loaders, excavators with grapples, bulldozers, grinders, self-loading trucks with knuckle booms, steer skid loaders, backhoes, track loaders, tractors, roll-off trucks, and cranes.

The efficiency of debris operations depends in large part on hauling time required to travel between the debris removal areas and the management or disposal sites. Strategies to increase efficiency include the following steps:

- First consolidate a transportation network, and then clear whole sectors. Transportation corridors progress from primary routes to secondary feeder roads to residential streets.
- Establish a transportation network with well-defined uses. Classify roads according to their use, vehicle speed, and destination linkage.
- Assign contractors to sectors. Sectors are prioritized so that access to essential services buildings are cleared first.
- Establish the number of passes (i.e., times a truck will travel a route to collect debris) to be completed. Communicate schedule with the general public.
- Have purchasing departments establish prior claim on contractors through Letters of Agreement. Procedures are developed in advance to ensure speedy procurement of services.
- Handle all soft goods such as bedding, mattresses, curtains, carpeting, and clothes as soon as possible. No salvageable material will be collected from these items, which will be extremely heavy and hard to handle and will need to be mechanically loaded by bucket loaders and/or excavators with grapples.
- Mark vehicles used in the transportation of debris (government, contractors, and others) by an easily identifiable permit or bar code to ensure unimpeded access to disaster areas.
- Reduce debris volume before hauling.

PICKING UP THE PIECES

Following these specific guidelines when hauling hurricane-related debris and household garbage to the curb will make for a speedier removal process



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Removal of debris from marine environments requires specialized equipment and experience. The following methods can be used for marine debris removal:

- **Point pickup:** This is the preferred method if it can be used, because it avoids environmental issues. The debris item is located, and grappling hooks (smaller items) or cranes (larger items) are used to lift it out of the water. Divers can assist if necessary.





- Trawling with nets: Nets are dragged along the bottom of a channel, in a manner similar to shrimp fishing. Usually heavy-duty debris nets are used to allow smaller fish to escape.
- Manual removal: Hand pickers working in shallow water locate debris by sight or touch and use rakes or hook poles to remove the material. Recovered items are loaded onto small vessels and transported to the shoreline for sorting and disposal.
- Removal of shoreline debris: Clearing certain types of shoreline debris from the waterside during removal of wet marine debris from the water may be most effective. Generally, shoreline debris consists of vegetation and construction and demolition items that lay partially in the water and on land. Prior to removal, the responsible party should be identified, as there may be conflicting opinions about who has the authority to perform the task.

BEST PRACTICES

Kansas Department of Health and Environment (KDHEKS) Household Medication Collection by Pharmacies:

- Establishment of a program whereby pharmacies can take back unused or expired medications from households.

Validity and appropriateness of best practices to be identified for inclusion in the handbook as it's developed.

LESSONS LEARNED

- FEMA and FHWA assistance with clearing debris:
 - In the rush to accomplish that mission, beginning with Hurricane Charley, it became apparent that not everyone was clear on the Federal-aid emergency assistance requirements. FHWA's Davis describes the process: "FHWA paid for the initial push to clear debris off the Federal-aid highways and the first pass to remove the debris. But local residents and repair crews would often put debris on the already cleared right-of-

way as they dug out from the storm's damage. That made it critical for local agencies to document debris removal, so we could verify what was in that initial push and first pass, and what was not. The most effective method used by local agencies to manage debris removal was to have tickets completed for each load, detailing where and when it was picked up and its disposal."

- To further complicate the situation, some agencies did not understand basic differences in disaster assistance from FHWA and FEMA. "Unfortunately, there was sometimes confusion regarding FHWA's ER program and FEMA's emergency aid program," Davis explains. "A few local agencies and some public assistance representatives operated with the understanding that FEMA would reimburse them for all their debris removal costs. Later, when FEMA processed the claims, the expenses that were FHWA-eligible were kicked back to the local communities. At that point, they would notify us, and a much delayed FHWA ER process could begin. That's why we're still hearing about new claims months after a storm hit."

Source: The paragraphs above are an excerpt from the Government Accountability Office Report, Hurricane Katrina: Continuing Debris Removal and Disposal Issues.

- The Environmental Protection Agency (EPA) did not enforce the Clean Air Act regulations that complicated demolition of asbestos-containing structures in order to expedite the process. EPA observed demolition sites.

Included as part of the literature review. Validity and appropriateness of lessons learned to be identified for inclusion in the handbook as it's developed.

TOOLS

Disaster Assistance Policy (DAP) 9523.11—Hazardous Stump Extraction Worksheet

NCHRP TRB DEBRIS MANAGEMENT HANDBOOK

BACKGROUND REPORT: SEGREGATION

PREPARED BY: ALI VELASCO

DESCRIPTION

Debris segregation refers to the separation and organization of the entire waste generated by a disaster according to the specific treatment and disposal requirements. Only a segregation system can ensure that the waste is treated according to its hazards, the proper transportation equipment is used, and that the correct disposal routes are taken. Many communities are segregating their recyclable debris so that it does not have to be landfilled. During the recycling process, materials are segregated by type to later be used as raw material for the production of new and reconstituted materials.

FIELD SURVEY ANALYSIS

As of September 13, 2012, a total of 166 participants completed the debris management survey. They were asked if they have participated in any debris management operations and if so, how many.

- Thirty-five respondents, or 21%, indicated they have not worked in any debris management operations.
- One hundred respondents, or 60%, indicated they have participated in between one and five debris management operations.
- Eighteen respondents, or 11%, indicated they have participated in between six and ten debris management operations.
- Five respondents, or 3%, indicated they have participated in between 11 and 25 debris management operations. Eight respondents, or 5%, indicated they have participated in 25 or more debris management operations.

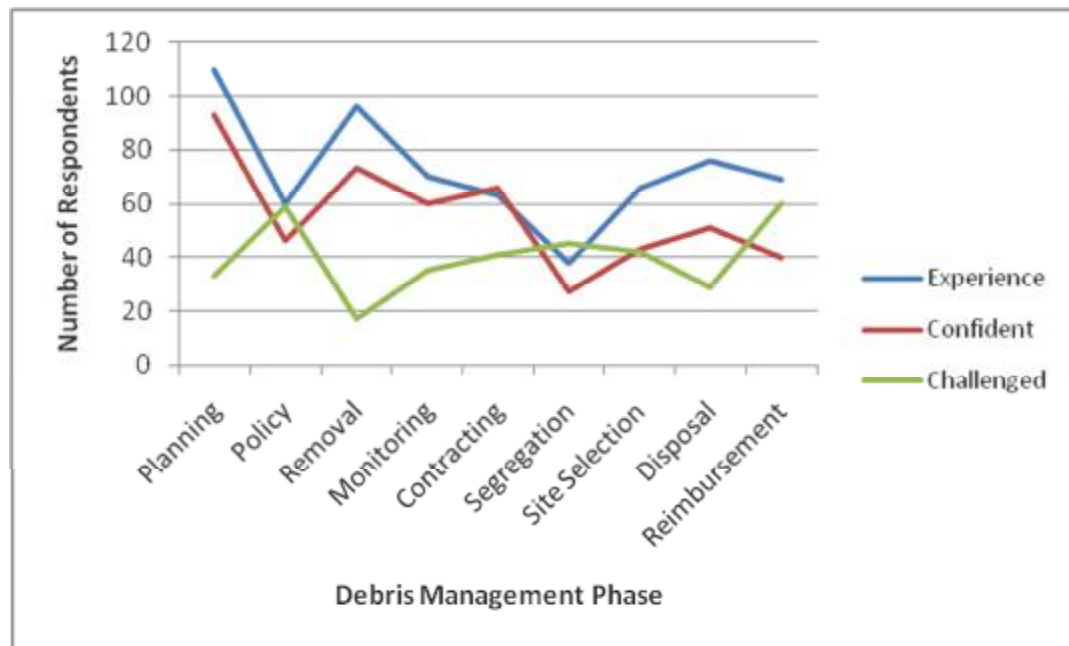
Respondents were asked in which areas they have participated.

- Thirty-eight respondents, or 23%, indicated they have participated in the debris segregation process.

Respondents were asked to rate their level of expertise.

- Twenty-seven respondents, or 16%, indicated they feel confident in this process; and
- Forty-five respondents, or 27%, indicated they feel challenged in this process.

+ Survey participants could select more than one category, so the total responses may add up to more than 100% or the total number of respondents.

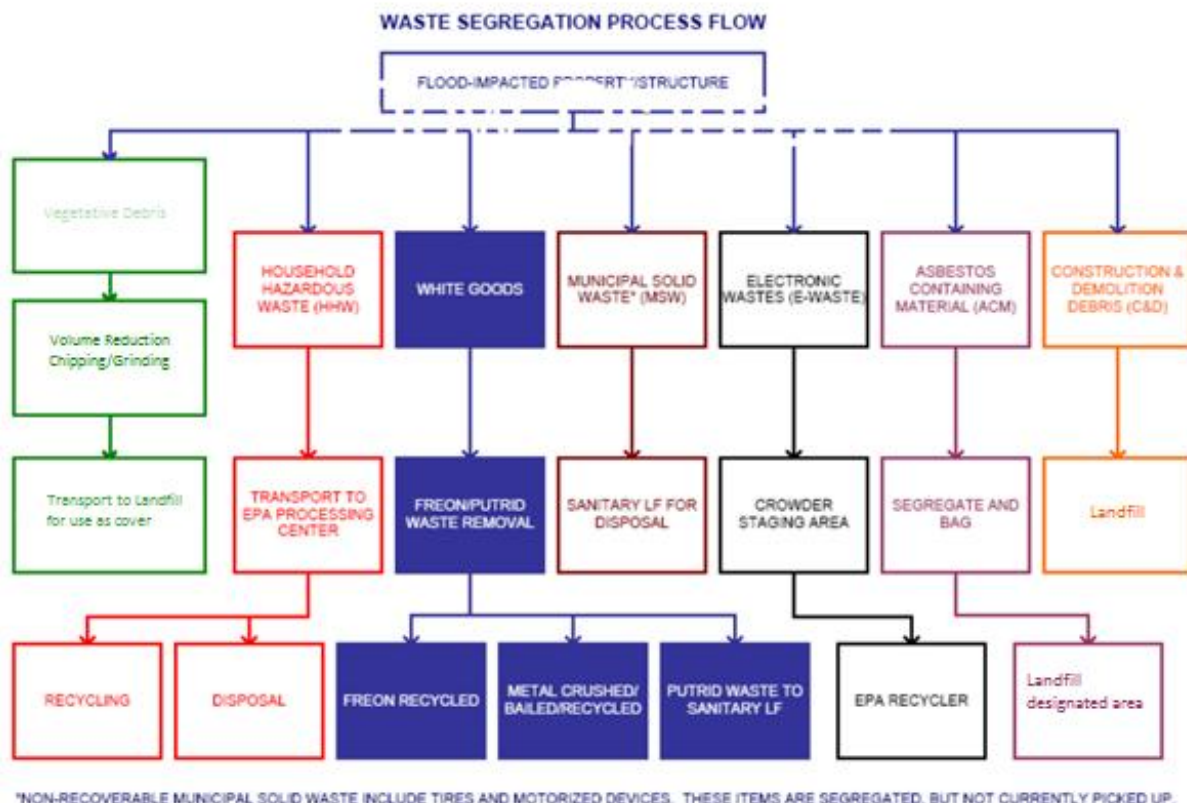


DETAILED INFORMATION

WHY IS SEGREGATION IMPORTANT?

The primary drivers for segregating debris are limited landfill space and legal requirements governing the disposal of hazardous waste, infectious materials, and other wastes that pose an environmental hazard. If debris generated by an event is not disposed of properly, it could endanger public health and the environment. Reducing the volume of some materials prior to transporting them saves landfill space. Segregation is also important from a financial perspective, as the salvage money obtained from segregating and reusing or recycling waste may offset expenses from the debris removal; it maximizes the recovery of materials at a lower cost than disposal. The Federal Emergency Management Agency (FEMA) encourages State and local governments, tribal authorities, and private nonprofit organizations to take a proactive approach toward coordination and management of debris removal operations as part of their overall emergency management plans. Such an approach builds an ongoing capability to continue managing similar waste materials in the future.

WHAT IS INVOLVED IN SEGREGATION?



This phase includes the segregation of debris according to material composition and potential health and environmental hazards. Debris is divided among different categories:

1. Construction and demolition debris – Construction and demolition (C&D) debris is defined as “damaged components of buildings and structures such as lumber and wood, gypsum wallboard, glass, metal, roofing material, tile, carpeting and floor coverings, window coverings, pipe, concrete, fully cured asphalt, equipment, furnishings, and fixtures.” C&D debris that is clear of asbestos and hazardous materials should be recycled to the extent possible, and the remainder disposed of in a permitted C&D landfill.
2. Hazardous waste – Hazardous waste is regulated under the Resource Conservation and Recovery Act (RCRA). According to RCRA, hazardous waste is any material exhibiting at least one of the following four characteristics: ignitability, corrosivity, reactivity, or toxicity. Special precautions may be required for this type of waste, including wearing personal protective equipment, decontaminating trucks, using special containers, and maintaining chain-of-custody.

- Household hazardous waste – Includes consumer products that exhibit the characteristics of a hazardous waste. Examples include some household cleaning products, latex- and oil-based paint, gasoline and oil, cleaning solvents, pool chemicals, and pesticides. Handling should be the same as for other types of hazardous waste.
- 3. Vegetative – Includes leaves, brush, limbs, branches, trunks, and stumps. This type of debris can be voluminous, and reducing it can decrease its volume by 75 to 95% (see Background Report on Disposal). Vegetative debris that is free of contaminants can be reused or recycled, further reducing its impact on landfill space.
- 4. White goods – Includes household appliances such as washers, dryers, refrigerators, freezers, ovens, ranges, heat pumps, water heaters, and air conditioners. Many white goods contain refrigerants, mercury, or oils that must be removed and processed according to environmental regulations before the white goods can be further processed for recycling or disposal. White goods should also be cleaned of all putrescent debris prior to removal and disposal.
- 5. Electronics waste – Includes household electronics that contain hazardous materials such as cathode ray tubes. Common examples are computer monitors and old televisions. Electronic wastes may also contain chemicals and minerals that require special treatment or disposal methods.
- 6. Putrescent debris – Includes any debris that could decompose or rot, such as animal carcasses and other fleshy organic matter, and must be handled in accordance with all applicable local ordinances and State and Federal regulations.
- 7. Infectious waste – Could cause infections in humans, and includes blood and blood products, human and animal waste, medical waste, pathological waste, and discarded sharp objects such as needles and scalpels. Handling, treatment, and disposal of this type of waste are generally under the authority of another agency, such as the Centers for Disease Control and Prevention (CDC) or Environmental Protection Agency (EPA).
- 8. Municipal solid waste – Includes general household garbage such as food, plastics, packaging, and paper that can be disposed of in a municipal landfill.
- 9. Soil, mud, sand, and snow – Should be evaluated to determine if they contain any contaminants. If so, they should be handled, processed, and disposed of according to environmental regulations governing the type of contaminant. If these debris types are determined to be free of contaminants, they may be combined with other organic materials at the debris management site and recycled or reused.
- 10. Vehicles and vessels – May be damaged, destroyed, displaced, or lost as a result of a disaster. The owners may abandon them if they have relocated or because of the amount of damage. Vehicle and vessel debris must be processed to remove all of the fluids and minerals before they can be recycled, salvaged, or destroyed.
- 11. Chemical, biological, radiological, or nuclear-contaminated (CBRN) debris – The segregation, treatment, removal, and disposal of these types of debris should be handled by specialists and overseen by the EPA, which is designated as the lead Federal agency for handling these materials according to Emergency Support Function ESF#10 in the National Response Framework.
 - Crime scene – If the debris is the result of an intentional manmade disaster, it may be considered part of a crime scene. In these cases, law enforcement officials must clear the debris before it is removed from its original location so as not to undermine the integrity of the evidence.

The primary objective is to separate vegetative debris, C&D materials, and municipal solid wastes from other materials requiring special handling in order to minimize the potential for C&D and municipal landfills from becoming Superfund sites due to comingling with hazardous and other types of wastes.

Debris segregation can also help facilitate the pickup, transport, and disposal of debris; therefore, it marks an important phase in debris management.

WHEN SHOULD SEGREGATION OF DEBRIS BE DONE?

As soon as the event has passed and before debris removal operations begin in earnest, segregation of debris should take place in order to understand the community needs and assess them as best as possible. The public information officer is responsible for providing information and guidance regarding debris management activities, including how to segregate debris.

Debris can be segregated using several different methods. Curbside segregation of debris typically is the most efficient and cost-effective method of debris management. Residents are requested to sort debris by type and place it at the curbside, outside of private property. The segregated debris piles should be placed in the right-of-way and clear of obstructions such as mailboxes, fire hydrants, gas meters, and telephone poles. This method of segregation might require additional trucks to remove each type of debris, but overall, it has been found to be the most efficient in densely populated areas. Curbside segregation also can be accomplished by pickup crews, but this process is labor-intensive and can be costly.

If debris is not segregated at the curbside, it may be picked up as mixed debris and hauled to a debris management site, where the task is performed. The costs to haul the debris may be less than for curbside segregated debris because additional trucks are not required, but the cost of labor-intensive operations at the debris management site could more than offset the cost savings from the hauling operation. Furthermore, segregation at the debris management site requires additional space to conduct operations. In urban areas where space is at a premium, this approach may not be desirable or even possible.

In rural areas and other places where curbside pickup locations may be too far apart to promote efficient debris removal operations, residents might be asked to bring their debris to designated drop-off locations. At these locations, residents segregate their debris as they drop it off; piles are sorted by debris type at the drop-off location.

WHO IS RESPONSIBLE FOR THIS PROCESS?

Coordinated efforts of homeowners, the business community, local and State government agencies, contractors, and monitors can contribute to effective debris segregation activities, ultimately resulting in more efficient debris removal and disposal operations. Home and business owners and local government and nonprofit officials should be responsible for sorting and segregating debris originating from their property. They should place debris sorted by type in separate piles at the curb in the public

right-of-way or on public property for pickup, or bring segregated materials to designated drop-off points.

In most cases, debris removal contractors will be responsible for picking up debris; although in some instances, local government agencies will use their own in-house resources to do so. If possible, they will pick up segregated debris from the curbside and rights-of-way. If debris deposited at the curbside is mixed, the contractor may be responsible for segregating it at the loading point, or tasked with segregating debris at the debris management site.

Site monitors observe curbside loading as well as truckloads of debris entering a debris management or disposal site. The monitors ensure that materials are properly segregated and deposited in the appropriate locations within the site.

HOW SHOULD THIS PHASE BE ACCOMPLISHED?

Debris typically is segregated by hand when it is brought to the curbside, as shown in the figure below.

HELPFUL HINTS

- Place all garbage carts and bags containing household garbage at the curbside away from all tornado-related debris for collection
- Refrigerator and freezer doors must be secured with duct tape
- Make sure that no debris blocks or protrudes into the road way
- Share piles with neighbors
- Do not place debris on top of water meters, gas meters or fire hydrants
- Do not place debris directly around mail boxes, power poles, or other inanimate objects
- Do not place debris under power lines

PICKING UP THE PIECES

Following these specific guidelines when hauling tornado-related debris and household garbage to the curb will make for a speedier removal process.

✓ CORRECT WAY

Homeowners are being asked to **SEPARATE** debris into following categories:

1 HOUSEHOLD GARBAGE <ul style="list-style-type: none"> Bagged Garbage Discard food (bagged) Packaging, papers, etc. (bagged) <p><small>All garbage should be placed curbside the night before your scheduled pick-up day</small></p>	2 CONSTRUCTION DEBRIS <ul style="list-style-type: none"> Building materials Drywall Lumber Carpet Furniture Mattresses Plumbing 	3 VEGETATIVE DEBRIS <ul style="list-style-type: none"> Tree branches Limbs Logs 	4 HOUSEHOLD HAZARDOUS WASTE <ul style="list-style-type: none"> Oil Batteries Pesticides Paints Cleaning supplies Compressed gas 	5 WHITE GOODS <ul style="list-style-type: none"> Refrigerators Washers, Dryers Freezers Air Conditioners Stoves Water heater Dishwasher 	6 ELECTRONICS <ul style="list-style-type: none"> Television Computer Radio Barbec DVD players Telephones
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✗ WRONG WAY

CROSSING THE LINE

Any debris placed further than 10 feet of the edge of the pavement toward your home will not be picked up. Debris will not be collected from private property.

PROPPING UP

Do not set debris against trees or poles. Doing so makes it harder for crews to collect the items

SEPARATE AND PLACE ALL DEBRIS AT THE CURB

Updated information at the following:
Tuscaloosa 311
www.tuscaloosa.com
www.facebook.com/TuscaloosaAlabama
Version 1.0 3-1-11

REPORT ALL TORNADO-RELATED STORM DAMAGE TO FEMA AND YOUR INSURANCE COMPANY.

Register with FEMA one of the following ways

- 1) Call 1-800-621-FEMA (3502)
- 2) www.FEMA.gov
- 3) Visit a FEMA Disaster Recovery Center
 - o American Legion Post: 3120 University Blvd, Tuscaloosa, AL 35404
 - o Cooling Town Hall: 11281 Stephens Loop Rd, Cooling, AL 35023

OTHER ASSISTANCE OPTIONS
Internet access is available at all **Tuscaloosa Public Library** locations - (205)345-5820

MAINE 1801 Jack Warner Parkway, Tuscaloosa, AL 35401 (assistance available)

BROWN 300 Bobby Miller Parkway, Tuscaloosa, AL 35405

WEAVER BOLDEN 2252 Lanier Avenue, Tuscaloosa, AL 35403

For assistance separating and moving debris to the curb call - (205) 248- 5045
Visit www.GovTuscaloosa.com

6

If debris is picked up as mixed materials (not segregated at curbside), segregation generally is accomplished at the debris management site by hand prior to final disposal. In these cases, conveyor belts can be used to assist with the recycling process. Manual or vibrating screens can be used to remove soil and sand from other debris materials.

BEST PRACTICES

“Public information and involvement made for a smooth debris management operation.”—Source: Debris Management: The American Samoa Joint Field Office’s Formation of the Interagency Debris Management Task Force.

Validity and appropriateness of best practices to be identified for inclusion in the handbook as it’s developed.

TOOLS

Ohio Emergency Management Agency Sample Debris Management Plan -
http://ema.ohio.gov/Documents/DRB/Debris_Plan.pdf

LESSONS LEARNED

U.S. Army Corps of Engineers Debris Management Lessons Learned
<http://www.newmoa.org/solidwaste/cwm/disdeb/ACEKATRINAVersion4.pdf>

Included as part of the literature review. Validity and appropriateness of lessons learned to be identified for inclusion in the handbook as it’s developed.

NCHRP TRB DEBRIS MANAGEMENT HANDBOOK

BACKGROUND REPORT: SITE SELECTION

PREPARED BY: ALI VELASCO

DESCRIPTION

This report is intended to assist public officials in making decisions regarding debris management. Site selection is critical in the debris management process as it will have an impact on the environment, public health, removal time, future liability, and potential loss of State and Federal funding.

Key elements for consideration in the debris disposal site selection process include location, ownership, operations, and site closeout.

FIELD SURVEY ANALYSIS

The survey was emailed to State and local representatives through the following organizations (membership numbers for the organizations are shown in parentheses):

- Transportation Research Board (TRB) state representatives (50)
- International City/County Management Association (ICMA) (9,000)
- American Public Works Association (APWA) (28,600)
- Solid Waste Association of North America (SWANA) (8,000)
- International Association of Emergency Managers (IAEM) (5,000)

Total: 50,650

While most of these organizations have large membership bases, interests of their members vary, meaning a good number of their membership may not deal with debris issues. We did not anticipate a huge response rate and were pleased with the responses we received from a diverse group of respondents. A total of 166 responses were received, mostly representing local governments. They were asked if they have participated in any debris management operations and if so, how many.

- Thirty-five respondents, or 21%, indicated they have not worked in any debris management operations.

- One hundred respondents, or 60%, indicated they have participated in between one and five debris management operations.
- Eighteen respondents, or 11%, indicated they have participated in between six and 10 debris management operations.
- Five respondents, or 3%, indicated they have participated in between 11 and 25 debris management operations.
- Eight respondents, or 5%, indicated they have participated in 25 or more debris management operations.

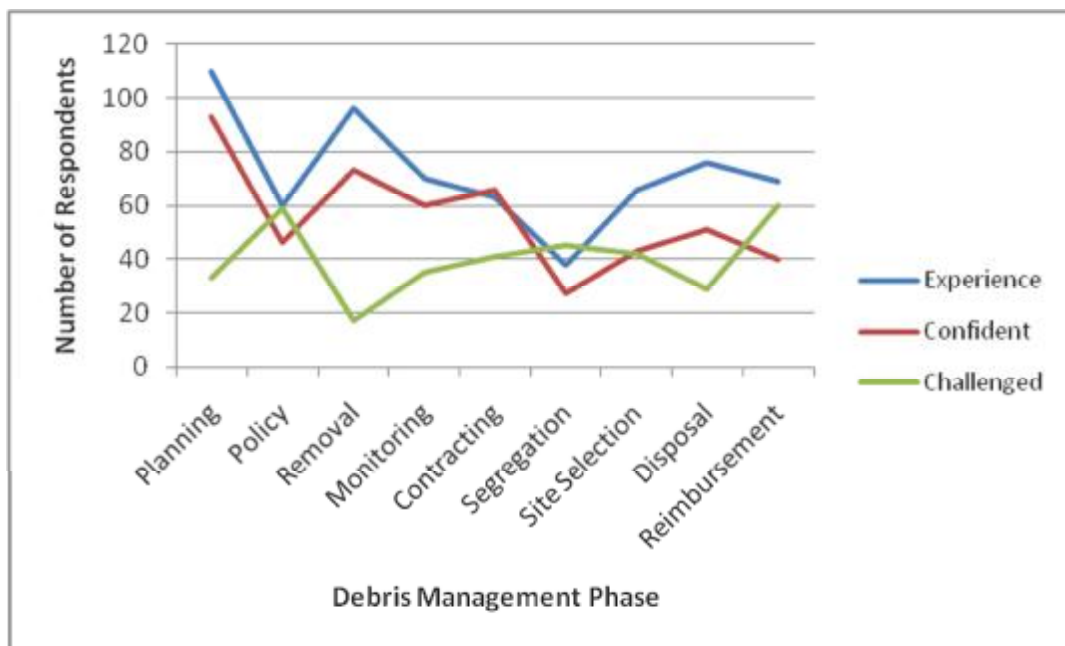
They were asked in which areas they have participated.

- Sixty respondents, or 40%, have indicated they have participated in the site selection process.

Respondents were asked to rate their level of expertise:

- Forty-three respondents, or 26%, indicated they feel confident in this process, and
- Forty-two respondents, or 25%, indicated they feel challenged in this process.

+ Survey participants could select more than one category, so the total responses may add up to more than 100% or the total number of respondents.



DETAILED INFORMATION

WHY IS SITE SELECTION IMPORTANT?

After a disaster event, restoring the community to its previous condition is a high priority. Debris from a disaster event can be harmful to public health and the environment. Speeding up

the process of recovery can reduce or eliminate the potential for health hazards and irreversible environmental damages as well as expedite the community's economic recovery.

Pre-identifying and approving potential staging and disposal locations before a disaster event helps the community understand its capacity to handle the potential debris volume generated by various prescribed situations. If the community does not have sufficient capacity to handle the volume of debris predicted for different events, identifying this issue in advance allows leaders to pursue other options, such as establishing memoranda of understanding with neighboring communities for use of their sites.

These pre-event actions serve to decrease response time. Once potential sites are identified, their use may be further expedited by preparing and submitting a permit application that includes a site map showing topography, a description of the location and its surrounding areas, a pre-approved operations plan, and other information specific to the location to the Department of Environmental Quality (DEQ) or other authorized agency responsible for site authorization and approval. Then, in the event of a disaster, local governments are able to obtain a letter of authorization for use of the temporary site within a short time after notification.

WHAT IS INCLUDED IN THE SITE SELECTION?

Several factors should be considered when identifying and selecting a location for debris management sites.

Site Ownership

Because of cost, liability, environmental and other considerations, public land use is recommended when possible to avoid potentially expensive and complicated leasing arrangements. Locating sites on previously developed property is preferable. Ideally, debris management sites can be located within the footprint of an existing facility that is used for similar activities, such as an existing permitted landfill. Privately owned land should be used only if no public sites are available. When using private lands, proper, detailed usage agreements should be obtained from all parties having an ownership interest.

Site Identification

When pre-identifying a temporary debris storage site, it is important to have an interdisciplinary approach in order to consider critical factors and avoid potential problems. As stated earlier, using public lands is preferable whenever possible to avoid unnecessary expenses and issues at closeout. The site should have limited access, with only certain areas open to the public for dropping off debris. If using private land, a lease should be developed that clearly prescribes all conditions, closeout procedures, timetables, and provisions for temporary waivers regarding normal site use.

Debris storage sites are normally between 50 and 200 acres. A larger site generally means that fewer sites are needed for temporary debris storage. Entry to and exit from the site and closeout are also easier; therefore, larger sites are recommended when feasible. Potential impacts from noise, odor, dust, traffic, and pre-existing conditions are essential to consider in the process of identifying debris storage sites.

Debris site locations are not to be located in wetlands or floodplains and should be situated an appropriate distance from potable water wells and rivers, lakes and streams. When possible, the debris site location should be close to the affected area but far enough away from residences, infrastructure and businesses so that site operations would not have a negative impact. Debris management sites should consider ease of access, entry, and exit to accommodate the flow of trucks without affecting the passage of traffic adjacent to the site. Debris management planning staff should coordinate with the Department of Transportation to adjust traffic and road signs to adapt to the expected truck traffic on the temporary debris site routes.

Creating an appendix to the debris management plan with the agencies involved in the debris management process and their roles is recommended, because it is a useful tool to quickly determine who is responsible for the pre-selection and authorization of the temporary debris management site (TDMS). This will improve the efficiency of removing and transporting debris from roads and public rights-of-way to the debris management site.

Owners of debris management sites should ensure controls are implemented to ensure public safety and control the spread of contaminants to the environment. Recommended methods are listed below:

- Active fire protection device such as fire extinguisher, fire hydrant, or water connection.
- Sediment control devices such as silt fence, sand bag barrier, or storm drain inlet protection to prevent discharge of contaminated water into a nearby stream, river, lake, or other body of water.
- Implementation of erosion control devices to control spread of dust outside of the TDMS.
- Safety monitors to indicate entry and exit for truck removal contractors and residents.
- Signs should be located at the entrance of the site to indicate hours of operation and materials accepted.
- Site should be fenced in order to control access of unauthorized personnel after hours of operation.

WHEN SHOULD SITE SELECTION BE ADDRESSED?

A TDMS must be designed to protect human health and the environment. Local officials are encouraged to pre-designate sites to allow post-event cleanup efforts to begin early and to be conducted efficiently.

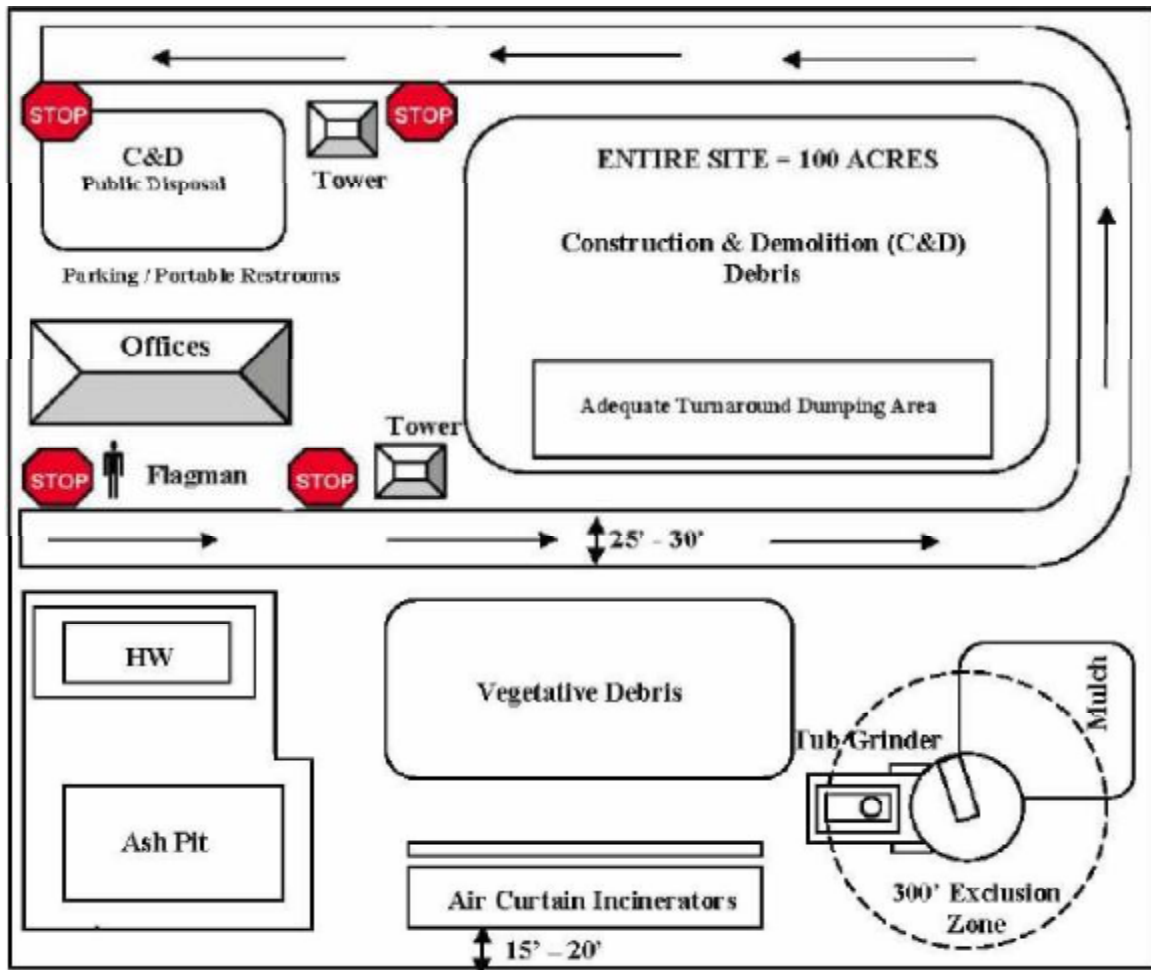
The county or local government will need to find the site and prepare an authorization letter with the DEQ solid waste staff. Pre-identifying sites before an event occurs is preferable so enough TDMSs are available to handle the capacity of debris generated.

Information for the pre-identified site should be included in the Debris Management plan. Including information such as site accessibility, with entry and exit routes, site layouts with the location of different reduction activities, and map locations will expedite the recovery process.

Once a TDMS is no longer needed, it should be closed. Property will have to be restored to its previous condition, and to be considered as such, no trace of operations should remain.

- Vegetative material, inert debris and ash from approved air curtains should be removed to a properly approved solid waste management site.
- Any equipment for processes such as chipping and grinding; air curtains; or structures built on site, such as monitoring towers; should be removed from the property.
- Tires must be disposed of at a scrap tire collection or processing facility.
- White goods such as appliances and other metal scrap should be separated for recycling.
- All other materials that are not inert debris as well as inert debris that is mixed with such materials should be removed to a properly permitted construction and demolition (C&D) recycling facility, C&D landfill, or municipal solid waste landfill.

An environmental evaluation can determine if the surroundings and the property were restored to normal conditions. Possible remediation may need to occur to assure sites were properly restored to pre-activity conditions. The site should be stabilized with erosion control measures, including establishment of vegetative cover, in accordance with regulations. The appropriate authorities should review any temporary site to determine if the closure provisions have been adequately addressed.



WHO IS RESPONSIBLE FOR SITE SELECTION?

The county or local government is responsible for implementing procedures for selection, operation, and closure of temporary debris reduction site. Local environmental specialists can assist municipalities with finding a suitable site and complying with any State and Federal environmental requirements. DEQs can assist in establishing emergency disposal sites for storm debris.

As mentioned earlier, an appendix with agencies such as Solid Waste, DEQ, Public Works and Transportation should be established to identify who has primary responsibility for site selection, preparation, operation and closure approval, as each State and jurisdiction has its own policies and procedures. The county or local government will need to find the site and discuss permitting criteria and the pre-identification process with the owner of the property or anticipated operator of the temporary disposal site. Based on this information, the agency responsible for site approval should be able to determine if the site is adequate for a temporary transfer station and provide a preliminary assessment to the local government.

HOW ARE DEBRIS MANAGEMENT SITE SELECTED?

Select a design event or events

Publicly owned land is preferred for temporary sites, but if it is not available, officials can confer with the property owner and obtain a Memorandum of Understanding (MOU) or other required documents allowing for use of the land as a debris management site. A location with a flat topography, and easy entry and exit is recommended, and if possible, it should be near the final disposition site to avoid long hauling distances.

Selection of the TDMS requires forecasting quantities of debris based on the location of the event, whether rural, urban or agricultural. The type of event forecast can determine the most common debris for the area. This can also help decide the layout of the TDMS according to the processing method used at the site, the equipment that will be used, and its designated area, traffic flow, and space for segregation, chipping, grinding and incineration, among other processes. Obtaining a site plan or estimated dimensions of the location being considered can help determine if it has sufficient capacity for the design event.

A debris model such as the one by the U.S. Army Corps of Engineers can be used to predict the quantities of debris that will be generated by the design event. Consulting with government agencies, aerial imagery, maps, and other visual tools can identify potential sites. A TDMS should not be located in an environmentally or historically protected area. A TDMS located near schools, health care facilities, or any other sensitive area that could have a negative impact on the community is not recommended. Other items for consideration include traffic patterns and flow; proximity to residences, businesses, and schools; and distance from water bodies.

Documenting a location before it is used as a TDMS is essential. Current conditions should be documented by photographs or videotape. Soil and water samples are needed before activities begin and samples should also be taken at closeout to compare post-activity conditions to pre-activity conditions.

It is advantageous to have a coordinated debris management plan developed in advance of a debris-generating event to expedite the response and recovery process.

LESSONS LEARNED

Included as part of the literature review. Validity and appropriateness of lessons learned to be identified for inclusion in the handbook as it's developed.

NCHRP TRB DEBRIS MANAGEMENT HANDBOOK

BACKGROUND REPORT: MONITORING

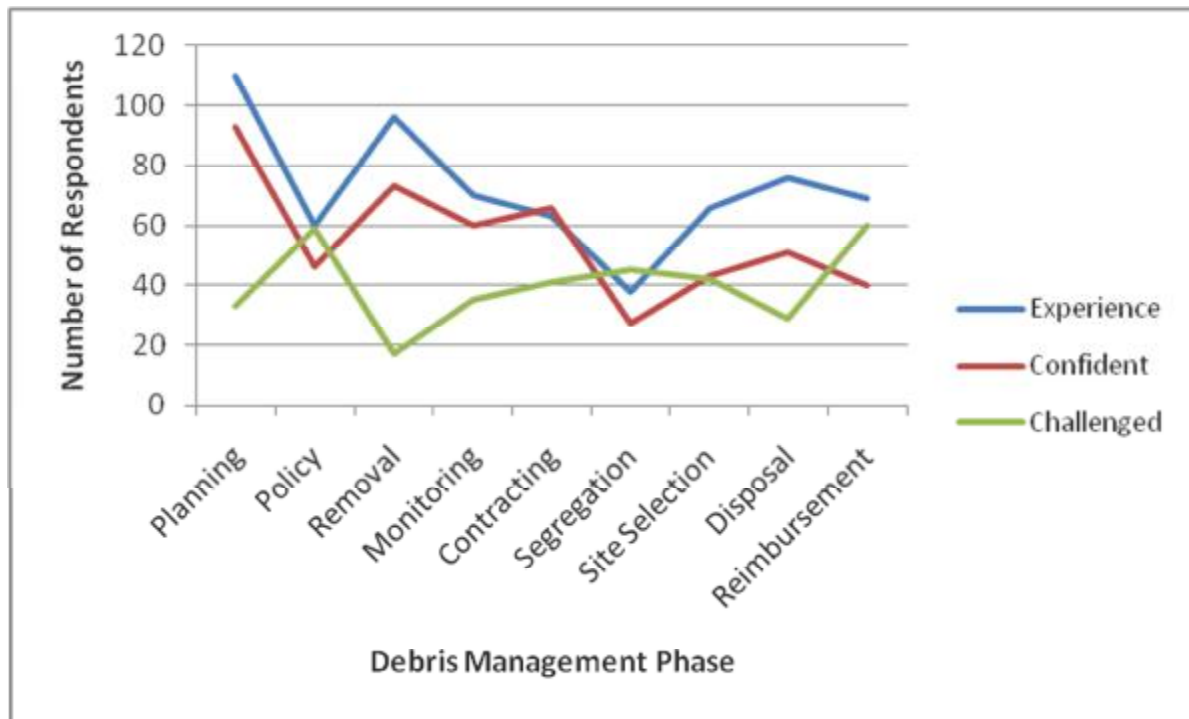
PREPARED BY: JUAN R. NIEVES

DESCRIPTION

Debris monitoring refers to the actions required to ensure that debris removal operations are efficient, effective, and eligible for Federal grant funding. Debris monitoring operations require comprehensive observation and documentation of work performed from the point of debris collection to final disposal. Monitoring debris removal work involves constant observation of crews to ensure that workers are performing eligible work in accordance with all applicable Federal, State, and local regulations. Failure to properly monitor debris removal operations may jeopardize public funding.

FIELD SURVEY ANALYSIS

As of September 24, 2012, 60 of the 166 survey respondents, or 36%, indicated that they felt confident about their debris monitoring capabilities, while only 35 respondents, or 21%, felt challenged by it. Approximately 42% of respondents to the field survey had experience with debris monitoring. Those who felt challenged by debris monitoring expressed concern about the amount of documentation and paperwork required for reimbursement as well as the number of personnel required to perform the work in the event of a significant incident.



DETAILED INFORMATION

WHY IS DEBRIS MONITORING IMPORTANT?

Debris monitoring is important for mainly two reasons: to prepare documentation required for public Federal program grant reimbursement and to supervise the work of hired contractors.

Accurate documentation of debris removal and disposal operations and eligible associated costs is the outcome of a good debris monitoring program. This documentation serves as the basis for the grant applications that authorize grant reimbursements from the Federal agencies. Failure to document eligible work and costs may jeopardize grant funding. Federal agencies periodically validate the applicant's monitoring efforts to ensure that eligible debris is being removed and processed efficiently. Debris monitoring serves to document eligibility issues that may complicate the reimbursement phase.

If the applicant (State or local government, Native American Tribe or authorized Tribal organization or Alaskan Native Villages, and certain private nonprofit organizations) has contracted for any component of the debris operation, debris monitoring is important to verify that the work completed is within the contract scope of work.

WHERE DO DEBRIS MONITORS WORK?

Debris monitors typically perform their work on behalf of the local jurisdiction where the incident occurred, the State, or the Federal agency that will be providing the reimbursement. They typically work in the field, either from their vehicles or tower platforms, depending on their role. Field monitors work at debris pickup sites, and they may follow loaded trucks to the dump site. Tower monitors may work at debris management sites and final deposition sites. A shift typically lasts from 10 to 14 hours,

depending on the operations plan. Debris monitors must be able to spend shifts in an outdoor environment and climb a staircase ladder of 10 feet or higher.

WHAT IS INVOLVED IN MONITORING DEBRIS?

Monitoring operations are meant to keep track and document details of all the work needed to complete the debris removal process. Monitors ensure that debris operations are carried out in accordance with the debris management plan, contract scopes of work, and applicable regulations. While local jurisdictions typically have primary responsibility for ensuring that debris operations are properly monitored, the State has responsibility for ensuring that the local jurisdiction is carrying out its monitoring responsibilities and for supplementing monitoring activities, as under most reimbursement programs it is the State that is awarded and administers the Federal funds. Furthermore, Federal Emergency Management Agency (FEMA) Public Assistance (PA) debris monitoring operations typically involve teams of two individuals, one from FEMA and one from the State, to act as roving monitors.

Debris monitoring requires individuals who are trained in debris operations to observe and document the actions taken to remove disaster-generated debris from eligible areas. Debris monitors fill several functions:

- Field Monitors/Roving Monitors
 - Monitor collection activities at load sites:
 - § Measure and certify (and recertify) truck capacities;
 - § Ensure that debris is segregated at the curbside;
 - § Ensure that hazardous waste is not mixed in with other waste types;
 - § Ensure that only eligible debris is being loaded into the truck; raise questions/issues with a Supervisor if it appears that debris outside the contract scope of work is being loaded;
 - § Ensure that trucks are not artificially loaded (e.g., wetted or fluffed);
 - § Observe methods for loading trucks (e.g., mechanical vs. hand loading);
 - § Record equipment used for loading and times of use;
 - § Check the area for safety considerations (e.g., downed power lines, traffic control needs);
 - § Check areas in and around debris piles to identify buried items such as fire hydrants and mailboxes, and help prevent damage from loading equipment;
 - § Validate hazardous trees, including leaners, hangers, and stumps;
 - § Issue field load tickets;
 - § Verify loads are properly contained before leaving the loading area (e.g., tailgates are secured, loads are covered if required);
 - § Ensure compliance with contract scope of work;
 - § Report to supervisor if work is not accomplished in accordance with local, State, and Federal ordinances and regulations;
 - § Ensure work area is clear of debris as specified in the contract before moving to a new loading area; and
 - § Maintain a log of the number of load tickets issued during the shift, the starting and ending load ticket numbers, problems encountered, and locations where debris was to be delivered.

- Monitor collection activities within debris zones:
 - § Ensure that only eligible debris is being picked up;
 - § Support recorded observations with digital photographs; and
 - § Make multiple visits to each load site daily.
- Site/Tower Monitors:
 - Complete load tickets at debris management and/or disposal sites;
 - Estimate the volumes of debris that have been transported;
 - Ensure that trucks are fully offloaded before leaving the debris management/disposal site; and
 - Maintain a log containing the truck numbers and volume of debris hauled, total amount of debris delivered during the shift, and problems encountered.
- Field Supervisors:
 - Manage the debris monitoring operation;
 - Schedule and deploy debris monitors to the necessary sites;
 - Oversee daily activities of debris monitors;
 - Have thorough understanding of the reimbursement program;
 - Resolve field eligibility and safety issues, and communicate these issues to the applicant;
 - Collect daily logs from the debris monitors and tabulate truck load data for the daily report.

The load ticket is one of the primary documentation items used to substantiate an applicant's request for government reimbursement. Therefore, it is essential that these documents be filled out completely and accurately. It is imperative to document both the amount of debris collected and the loading capacity of the vehicle hauling the debris. Trucks carrying quantities below their full capacities will have their estimated haul volume adjusted down based on visual inspection by the Field Debris Monitor, who will verify the quantity and type of debris contained in the bed of the truck from an inspection tower. The most commonly used unit for measuring debris volume is cubic yards (CY).

Load tickets not only document the type and quantity of debris collected in each load, but they also identify where the load site is located and where the debris was removed. An accurate record of debris load locations is important because some eligibility restrictions are based on the location where the debris is originally collected. For example, the FHWA ER program has some very specific guidelines regarding debris eligibility based on location within and adjacency to the Federal aid roadway. It is important to separate debris collection efforts from public property and private property; the FHWA ER program does not reimburse for any debris deposited in the public right-of-way from private property, and FEMA generally does not reimburse contractors for removing debris on private property. The location of any staging area and final disposal should be documented.

WHEN SHOULD THE APPLICANT START THE DEBRIS MONITORING OPERATION?

Government agencies and jurisdictions can take steps to prepare for catastrophic events by implementing a debris monitoring plan that would be executed at the time of the event. This will help to achieve a more rapid response by all the agencies involved and minimize the amount of confusion and standby time. Debris monitoring procedures should be established and included in the debris management plan for the applicant's financial interest. Agency employees (force account labor) should

be trained as debris monitors, even if a contractor will be used for long-term monitoring operations, to oversee response and recovery in the immediate aftermath of an event.

Debris monitoring should begin at the same time as debris removal, and be performed from the point of debris collection to final disposal. Often, force account labor, or a combination of force account and contract labor, are used to monitor debris clearance and removal operations for the first 70 hours after an event while emergency lifesaving operations are ongoing and while contracts are being activated and issued. As the response phase progresses to the recovery phase, personnel will be assigned debris monitoring tasks and locations in accordance with the debris management plan to supervise removal activities. Monitoring activities continue until debris operations are complete.

WHO IS INVOLVED IN THE DEBRIS MONITORING OPERATION?

Immediately after a disaster, monitoring activities are likely to be conducted by force account labor until monitoring contracts can be activated (if desired or necessary). If local resources are completely overwhelmed immediately after a disaster, the State may be able to provide some additional support on a short-term basis (e.g., State employees, National Guard) until other resources can be obtained. Supplemental resources might also be available through the Emergency Management Assistance Compact (EMAC).

Depending on the applicant's needs and preferences for long-term monitoring, the debris management operation can be staffed using force account labor and/or contracted labor. Contracting should follow the procurement requirements in the Stafford Act, legislation that established guidelines for the government's response to disasters. The Background Report on Contracting can be referenced for guidelines. The following key features can help the applicant choose which option is more beneficial to them:

Contracted Labor:

- Contractor assumes all training requirements.
- Employees serving in a force account labor capacity can resume normal daily functions.
- Regular and overtime labor hours are reimbursable.

Force Account Labor:

- Employees serving in a force account labor capacity are more familiar with neighboring conditions.
- After the necessary training, force account labor will be better prepared for future events.
- Regular labor hours are not reimbursable.

HOW TO CONDUCT DEBRIS MONITORING OPERATIONS IN AN EFFICIENT MANNER

Establishing a debris management plan builds the framework for organized, efficient debris monitoring operations. The debris management plan will likely identify debris operation zones, estimated quantities of debris that will be generated by a design event, and debris management sites. This information can be used to evaluate the approximate number of monitors that will be required for each zone during a prescribed event. Identifying the number of monitors that could be needed allows a

jurisdiction to train their employees and/or contract for monitors in advance, so that when an event occurs, operations can begin immediately.

Personnel who will be serving as debris monitors need to be trained in the requirements of the various debris programs, as well as in how to measure and estimate debris volume. They should be familiar with the local debris management plan and have an understanding of the scopes of work for debris removal contractors. If contractors will be used for long-term monitoring assignments, having pre-event debris monitoring contracts in place can expedite deployment to the field and ensure complete documentation of removal operations.

FEMA-325 Public Assistance, Debris Management Guide suggests that all three of the following tools be used to document debris removal operations. While these tools historically have been paper copies with duplicates, electronic tools have been created and may be available to expedite data management.

Debris Monitor Reports

As emphasized throughout this report, documentation is the most important aspect of debris monitoring. Preparing a debris monitoring report will provide consistency to all records regardless of who performs the work or from which grant program reimbursement will be sought. Applicants are encouraged to prepare a debris monitoring report format that captures the required information when seeking reimbursement, including:

- Actual labor hours worked
- Actual equipment hours operated
- Type and specification of equipment used

An example of a debris monitor's report is supplied in FEMA-325 Public Assistance, Debris Management Guide, Appendix D, Sample Monitoring Forms. Reports that can be completed electronically in a spreadsheet or database format can be used to easily tabulate data for reimbursement requests.

Truck Certification List

A truck certification list provides a standardized manner of identifying trucks and their hauling capacities. This information is important since debris, specifically vegetative debris, is often hauled and billed by volume. A comprehensive truck certification list should include:

- Size of hauling bed in cubic yards,
- License plate number,
- Truck identification number assigned by the owner, and
- Short physical description of the truck.

A computerized bar code system can be used to associate identifying information with a bar code assigned to each truck. The codes are scanned as the truck enters and leaves the Debris Management Site (DMS) or landfill.

Load Ticket System

A load ticket serves as the primary debris tracking document, and is used to document the volume of debris in each truck and the hauling distance per trip. If the applicant uses a contract hauler, the load

ticket is often used for billing purposes. Traditionally, load tickets have been carbon paper tickets with at least four copies generated for one load of debris. More advanced, electronic tracking tools for use with cell phones, tablets and Toughbooks have been developed and used in the field to reduce human error and facilitate data gathering and management.

BEST PRACTICES

Kansas Department of Health and Environment Emergency Support Function (ESF) #3, Debris Management Appendix

South Dakota Department of Public Safety, Debris Management Guide

State of Connecticut, Disaster Debris Management Plan, September 2008

Validity and appropriateness of best practices to be identified for inclusion in the handbook as it's developed.

LESSONS LEARNED

Included as part of the literature review. Validity and appropriateness of lessons learned to be identified for inclusion in the handbook as it's developed.

TOOLS

Debris Monitoring Field Pocket Guide for FEMA PA Program Region III

NCHRP TRB DEBRIS MANAGEMENT HANDBOOK

BACKGROUND REPORT: DISPOSAL

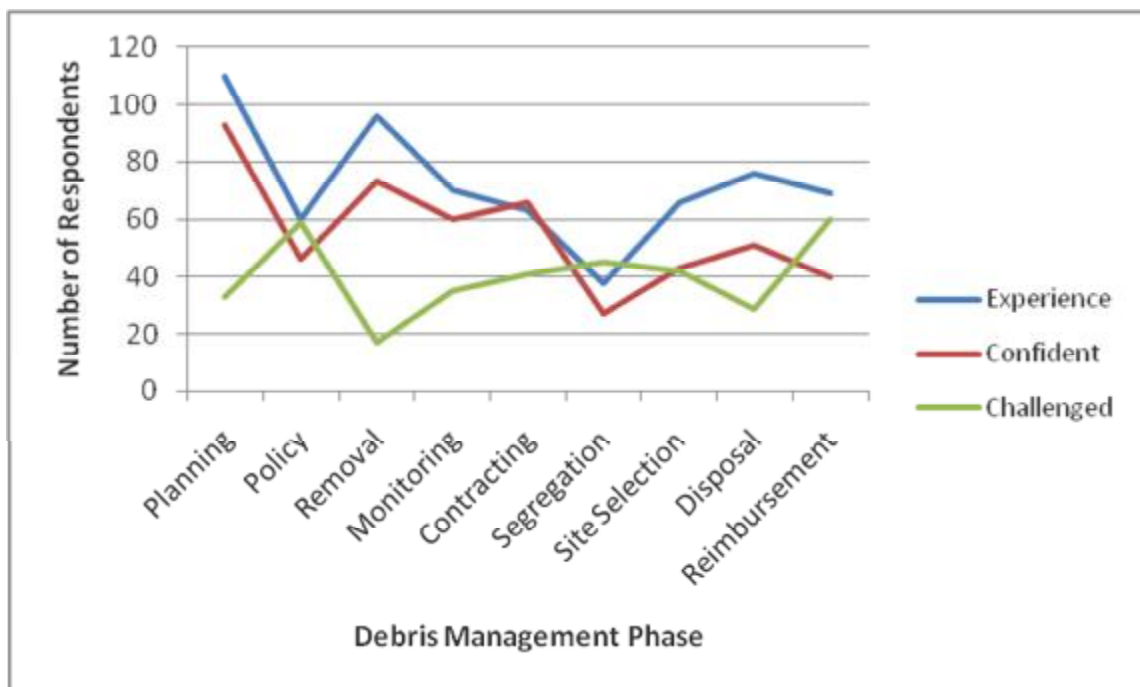
PREPARED BY: LAUREL MCGINLEY

DESCRIPTION

Debris disposal involves the volumetric reduction and final disposition of disaster-generated debris. Disposal must be accomplished in accordance with all local, State, and Federal environmental and health regulations, which can require special handling for different types of debris. Though historically disposal often occurred at landfills, the decreasing availability of space at these facilities is causing jurisdictions to evaluate other options.

FIELD SURVEY ANALYSIS

As of July 31, 2012, survey respondents generally indicated that they have experience with and are mostly comfortable with debris disposal. Forty-seven percent of respondents indicated that they have experience disposing of disaster-related debris. Of those with previous experience, 64% indicated that they felt confident about disposal operations while 36% said they felt challenged by it.



DETAILED INFORMATION

WHY IS DISPOSAL IMPORTANT?

Disasters can generate thousands to millions of cubic yards of waste. This is why it is critical that local jurisdictions consider options for final disposal of disaster-generated debris during the planning phase to ensure that sufficient space exists in landfills, to identify opportunities for recycling, and that all applicable local, State, and Federal environmental, health, and transport regulations are addressed.

As the amount of available landfill space decreases nationwide, recycling is becoming a prevalent part of disposal operations. In fact, some local and State governments have set ambitious policy goals and passed laws for solid waste diversion and recycling. Recycling can produce beneficial financial impacts for disaster recovery operations by reducing the amount of waste taken to a landfill, thus reducing the tipping fees paid to the landfill operator. Additionally, some types of debris have market value that can help offset removal costs.

WHAT DOES DEBRIS DISPOSAL ENTAIL?

Debris disposal generally occurs after segregation and can involve the volumetric reduction of some materials. The amount of reduction may be dependent, in part, on the amount of available landfill space (versus the cost to reduce the waste volume prior to disposition). Reduction methods include the following:

- Incineration – A common method used to reduce the volume of vegetative debris is incineration. Burning can result in volumetric reduction of up to 95%, and the ash sometimes can be recycled as a soil additive. Incineration methods available for vegetative volume reduction include:
 - Air Curtain Pit Incineration – Vegetative debris is burned in a pit constructed by digging below-grade or building above-grade and using a blower. The pit and blower constitute an engineered system that must work together precisely, and while there are no industry standards for design, knowledgeable personnel who are experienced with air curtain pit design and operations should oversee this process. When constructed and operated properly, air curtain pit burners can effectively reduce the volume of vegetative debris without having an adverse impact on the environment.
 - Portable Air Curtain Incineration – This uses the same methods as the air curtain pit incineration, but portable incinerators use a pre-manufactured pit rather than one that is dug or built on site. The primary advantage of a portable unit is that unlike an air curtain pit burner, it is not subject to erosion.
 - Controlled Open-Air Incineration – Vegetative debris is carefully burned in a contained, fixed area. This method generally has little adverse environmental impact and is cost-effective.
 - Uncontrolled Open-Air Incineration – Debris is burned without controlling the amount or speed at which the incineration takes place. This method allows debris volume to be reduced quickly. However, this method may not meet environmental regulations and therefore is generally regarded as the least desirable method of burning. If open-air

incineration must be used, it is recommended that air quality be monitored to ensure that there are not adverse impacts to the surrounding community and environment.

- Chipping and Grinding – Typically, chipping and grinding are used to reduce the volume of vegetative debris. However, these methods may also be applied to certain types of rubber, concrete, and metals before they are sent to a recycling plant. Chipping and grinding generally reduce the volume of material by 75%, and therefore are less efficient than incineration. However, the residual material may be used for other purposes, such as mulch, fuel for furnaces, or in a co-generation plant. Plastics, soil, and other contaminants must be removed prior to processing to minimize damage, wear, and tear on the grinder or chipper.
- As previously mentioned, recycling is another option for reducing and disposing of debris. Recycling may be particularly applicable to construction and demolition (C&D) debris, which may include concrete and metals. Recycling plants and re-users of recycled materials often have specific requirements depending on the types of products being supplied (for example, regarding grinding, shredding, and size of material). If recycling is part of disposal operations, it is important to understand the market specifications for these materials. When handled properly and with forethought, recycling can not only reduce the amount of waste brought to landfills; but also provide an economic opportunity to recover a portion of the costs of debris operations. Specialty contractors may bid on well-sorted (C&D) debris. In addition to C&D materials, relatively clean soil may also be recycled; it may be mixed with ash or mulch and reused for agricultural purposes.

Once volumetric reduction has been accomplished in accordance with the debris management plan, material that is not recycled or reused generally is trucked to a landfill and deposited. The amount of available space and environmental regulations typically govern where disaster debris can be landfilled. If a jurisdiction does not have sufficient space in its own landfill, then memoranda of agreement with other landfills may be needed to accommodate the quantity of debris being disposed. Landfill tipping fees can figure significantly into the overall cost of debris disposal, and should be considered during development of the debris management strategy. Similarly, other jurisdictions might charge taxes and other fees for use of their facilities, and these also should be considered.

WHEN DOES DEBRIS DISPOSAL OCCUR?

Where debris disposal takes place in relation to other debris operations components can depend on the steps identified in the debris management plan. If the plan calls for segregation at the curbside but does not include hauling the debris to a debris management site, then disposal can occur curbside (e.g., grinding and chipping) as segregated debris is picked up and then hauled to a landfill. If the plan calls for debris to be taken to a debris management site, then disposal typically occurs after segregation; materials that can be reduced and/or recycled are treated as they arrive on-site. Materials that are not going to be reused, whether they have been reduced or not, are taken to a landfill when there is sufficient volume on site to warrant trucking them off site.

WHO IS INVOLVED IN DEBRIS DISPOSAL?

There are potentially many parties involved in debris disposal operations:

- Applicant jurisdiction – The jurisdiction that “owns” the debris has overall responsibility for determining the debris management plan, which includes planning for disposal operations. This entity identifies target recycling and reuse rates; methods of reduction to be used (if any); and final disposal sites (landfills). They are responsible for obtaining the proper permits, overseeing contractor performance, and ensuring that proper documentation of operations is maintained. The particular agency having responsibility will vary with each jurisdiction, but typically the Department of Public Works or Solid Waste is designated as having primary responsibility.
- Department of Environmental Quality (DEQ) – The State environmental agency is responsible for issuing permits for reduction activities, particularly incineration. A DEQ also issues approval to use ash from burning operations as a soil or other additive, and oversees handling and disposal of hazardous materials and household hazardous waste.
- Other State agencies
 - Agriculture – May be involved in disposing of agricultural wastes and pesticides. May also assist with disposal of animal carcasses.
 - Forestry – May be involved in disposing of wastes such as termite-infested materials.
 - Health - May be involved in evaluating disposal methods for animal carcasses, radiological wastes.
 - Natural Resources – May assist with identifying recycling opportunities.
 - Transportation – May be involved in disposing of or recycling abandoned vehicles and vessels. Also regulates how debris is transported.
- Local fire department – Should be notified prior to commencing incineration operations.
- Contractors
 - Hauling contractors – May assist with expediting reduction by dumping segregated wastes at the appropriate locations within a debris management site. Must comply with transportation and environmental regulations when hauling debris to final disposal site.
 - Debris monitors – Ensure that debris loads are dumped at the appropriate locations within a debris management site. Oversee and assist with removing “contaminants” from debris to be chipped, ground, recycled, and reused. Ensure that debris being hauled to a landfill, either directly from curbside pickup or from a debris management site, is disposed of properly.
 - Specialty contractors – Bid on and haul recyclable materials to appropriate locations.
- Landfill operators – Identify available space, charge tipping fees, ensure final disposal is completed properly (in accordance with applicable regulations).
- Other jurisdictions – May enter into an agreement to provide facilities or technologies to assist with disposal operations. Identify what level of compensation and taxes, if any, will be paid by the entity being assisted.

HOW ARE DISPOSAL OPERATIONS IMPLEMENTED?

Disposal operations will be most effective and efficient if goals and strategies are set during development of the debris management plan. The plan should identify the acceptable methods of reduction, types of disposal facilities, and recycling opportunities.

- If chippers and grinders are used for reduction of vegetative debris, equipment should be operated and maintained in accordance with manufacturers' instructions. Buffer zones around the area of operation should be established to protect public health and safety.
- Forklifts, cranes, backhoes and trackhoes, bulldozers, and other similar equipment will be required to place materials into chippers, grinders, and shredders, as well as incinerators, and to load dump trucks for transporting materials to final disposal sites. In the case of fuel or hydraulic fluid spills or leakages, affected areas should be cleaned up quickly.
- If incineration will be accomplished, the particular method and equipment to be used should be identified. The local government agency should obtain the proper environmental permits.
- Debris piles should be handled promptly and not allowed to accumulate, to minimize environmental and safety risks, and prevent spontaneous combustion of vegetative debris piles. It is recommended that pile sizes be limited to 6 feet tall by 10 feet wide. Vegetative debris piles should be turned frequently to reduce the likelihood of combustion; it is recommended that piles be turned when temperatures reach 160 degrees Fahrenheit to dissipate accumulating heat and gases and allow cooling. Piles should be located near firefighting equipment in the event that spontaneous combustion occurs.
- Household white goods, such as refrigerators, ovens, and other appliances, should be prepared for final disposal. Solid waste, including putrescible waste (i.e., spoiled food) should be removed and disposed of in an appropriate landfill. Mercury and refrigerants should be removed by certified technicians; some refrigerants may be reclaimed or recycled. Treated white goods may be recycled. Some jurisdictions do not permit landfilling of white goods; check with your State or local landfill for requirements.
- Electronic waste should be segregated by type (e.g., televisions or computers), and placed in piles not exceeding six feet in height to minimize risk of collapse. Electronic waste should be protected from weather, if possible. Segregated electronic waste generally is placed on pallets and wrapped in plastic or placed in boxes for pickup by a qualified electronics recycler or shipping to an authorized facility. Only a qualified electronics recycler should process electronic waste.
- C&D wastes should be processed to remove contaminants such as asbestos-containing materials, white goods, and household hazardous waste. It is recommended that C&D piles not exceed 6 feet in height to minimize risk of collapse. Clean C&D debris may be recycled and/or transported to a C&D landfill for disposal.
- Trucks hauling materials to disposal and recycling sites should comply with all local, State, and Federal transportation regulations for transporting such wastes (e.g., bed liners, covers, permits, etc.).

BEST PRACTICES

Identified in literature review. Validity and appropriateness of best practices to be identified for inclusion in the handbook as it's developed.

LESSONS LEARNED

Validity and appropriateness of lessons learned to be identified for inclusion in the handbook as it's developed.

TOOLS

None identified as part of the literature review or field study.

NCHRP TRB DEBRIS MANAGEMENT HANDBOOK

BACKGROUND REPORT: REIMBURSEMENT

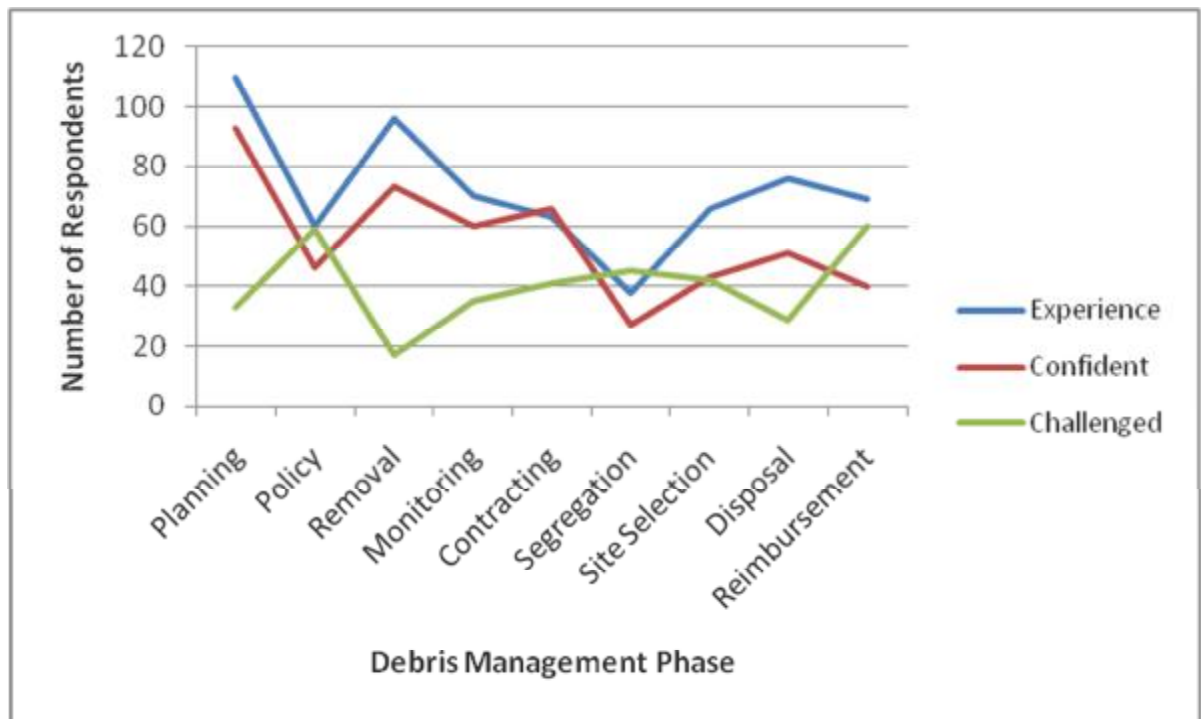
PREPARED BY: JUAN R. NIEVES

DESCRIPTION

The impact of major or catastrophic emergencies can exceed local financial resources. Several Federal and State agencies have reimbursement programs in place to compensate the affected communities and private non-profit institutions for their expenses in the recovery effort.

FIELD SURVEY ANALYSIS

As of September 24, 2012, 40 of the 166 survey respondents, or 24%, indicated that they felt confident about their debris reimbursement capabilities, while 60 respondents, or 36%, felt challenged by it. Approximately 43% of respondents to the field survey had experience with debris reimbursement.



DETAILED INFORMATION

WHY IS REIMBURSEMENT SO IMPORTANT TO COMMUNITIES AND PRIVATE NON-PROFIT INSTITUTIONS?

Debris removal is a time-consuming and costly operation that often results in a great expense to the affected communities and private non-profit institutions, who often seek financial aid from Federal and State agencies to help with the rebuilding process. Debris removal costs typically can be anywhere from 25 to 85% of the total cost of a disaster. The Federal Emergency Management Agency (FEMA)'s Debris Management Guide states that, "Over the last five years, debris removal operations accounted for approximately 27 percent of the disaster recovery costs." These costs could cripple a local economy if the community had to bear the full cost of debris operations. Federal programs such as the Federal Highway Administration's (FHWA) Emergency Relief program and FEMA's Public Assistance (PA) program will reimburse eligible applicants for eligible work at the rate of 75 to 100% of the total cost, depending on the program and the terms of the disaster declaration. While the applicant is still responsible for the non-funded portion of the cost, it is significantly less than it would be otherwise.

The following examples demonstrate how expensive debris removal operations can be for a community:

- *Hurricane Andrew* – An initial estimate of debris after the storm was 20 million cubic yards (CY) – enough to fill a football field a mile high. Removal took 6 months at an approximate cost of \$585 million.
- *World Trade Center* – Approximately 1.6 million tons of debris.
- *Southern California fires* – Approximately 64,000 tons, and \$13.2 million.
- *San Simeon Earthquake* – Approximately \$400,000 spent on debris removal. The quake had a magnitude of M6.5 when it struck in 2003.
- *Hurricane Katrina* – When the demolition of damaged property in the New Orleans metropolitan area is complete, Hurricane Katrina will have generated more than 100 million CY of disaster debris. Estimates of costs associated with removing and disposing of debris from the disaster range from \$2.5 billion to \$4.1 billion. To date, disaster debris totals from Katrina are estimated at:
 - 3.4 million CY in Alabama,
 - 45.8 million CY in Mississippi, and
 - 64.3 million CY in Louisiana (this total includes debris from Hurricane Rita).

WHAT IS INVOLVED IN THE REIMBURSEMENT PHASE?

After a disaster strikes, communities are left with scattered debris that usually impedes transportation and communication routes, posing a threat to public safety. Local governing entities are then forced to spend their community's funds on debris management operations. The affected communities often need the assistance of the Federal government to recover from the event.

Each Federal agency that oversees reimbursement for debris removal has different eligibility requirements. Local and State agencies planning to seek reimbursement must be able to demonstrate that they are eligible to apply, that damage occurred to a qualifying facility, the work performed is

appropriate for reimbursement according to program requirements, and that the costs are reasonable. Generally, eligible work must also be completed within certain timeframes and, if a contractor is used to accomplish any or all of the work, the contracting methods used must conform to Federal regulations. Additional information regarding contracting can be found in the Background Report on Contracting.

The reimbursement programs each require a grant application to be completed. The application format varies based on the program, but generally they require a description of the scope of work required, estimated or actual costs to complete the work, and documentation to substantiate the request.

Documentation is essential to the reimbursement process. An agency applying for a Federal reimbursement grant must be able to substantiate labor, equipment, and contractor costs associated with performing eligible work. Depending on the parameters of the reimbursement program, labor costs might include regular and allowable overtime hours associated with performing eligible work, and hourly rates plus fringe benefits. Timesheets for each individual performing eligible work should characterize the task and break it down by regular and overtime hours. Equipment costs could also specify the time equipment was in use (i.e., not idle) performing eligible work as well as hourly equipment usage rates, which typically include operation, insurance, maintenance, fuel, and depreciation. Equipment logs that document when and how certain equipment was used can also document equipment costs. Contractor costs should be substantiated based on the contractual agreement, which typically is based on the volume or weight of debris removed. Truck measurements and/or scale calibration, debris load tickets, and a load ticket database are typically used to document contractor costs.

Photographs can also be useful, to document equipment used for debris operations, trucks used for hauling, and quantities and types of debris piles.

WHEN DOES THE REIMBURSEMENT PHASE OCCUR?

Reimbursement typically occurs as work is completed. Most programs provide reimbursement based on actual costs, and therefore require documentation of all expenses. Most also require that a final inspection take place to verify the work is complete, and that it was accomplished in accordance with program requirements and the agreed upon scope of work. Once the final inspection is finished, the funds are released by the Federal agency to reimburse the local or State agency for the work. Many of the programs have provisions that allow some funds to be disbursed prior to project completion; typically this option may be exercised in response to larger disasters where damage is widespread.

WHO IS RESPONSIBLE FOR REIMBURSING THE AFFECTED APPLICANTS?

While FEMA is typically the Federal agency responsible for reimbursing applicants for eligible work, the Federal government provides reimbursement programs through several other agencies for damages not covered by FEMA. Therefore, the local agencies must determine which Federal agency provides reimbursement for which damages. An applicant may not receive funding from two sources for the same work item. The Stafford Act prohibits such a duplication of benefits. (See FEMA Policy 9525.3, Duplication of Benefits.) A State disaster assistance program is not considered a duplication of Federal funding. A summary of agencies that reimburse for activities related to debris operations follows.

Federal Emergency Management Agency

FEMA is the primary Federal funding agency for local jurisdictions to recover a portion of their costs associated with disaster debris operations. Before applying to FEMA, an applicant must not only meet FEMA PA program eligibility requirements, but they must also verify that the required work is not eligible for funding through another agency. FEMA is the “federal agency of last resort.”

FEMA PA funding is available only after the President declares an emergency or major disaster. For emergency declarations, only emergency work, that is, work that is required to “reduce/eliminate an immediate threat to life, public health, safety, or a threat of significant damage to improved public and private property through cost-effective measures,” is eligible for reimbursement. Debris removal is considered emergency work. For major disaster declarations, both emergency work and permanent work are eligible for reimbursement. The Federal share of the cost is typically 75%, although the President can make a determination in the disaster declaration that reimbursement will occur at rates of 90% or even 100%, depending on the magnitude and extent of the disaster. Costs below \$1,000 per project are not eligible.

Federal Highway Administration - Emergency Relief Program

The FHWA provides funds through the Emergency Relief (ER) Program to assist State and local governments with both emergency and permanent work on Federal aid roads. The ER Program limits State funding to \$100 million per disaster and \$20 million per disaster to U.S. Territories. Congress may pass special legislation to grant additional funding if the recovery efforts exceed the \$100 million per State cap.

All emergency work including debris removal and emergency repairs accomplished in the first 180 days after the disaster occurs may be reimbursed at 100 percent Federal share. For interstate highways, the Federal share is 90 percent. For all other highways, the Federal share is 80 percent. Permanent work funds are granted based on inspections performed by FHWA and State highway department personnel.

The ER Program is available independently of major disaster and emergency declarations made by the President. States are responsible for requesting the necessary ER funds. In order to initiate the ER application process, a notice of intent to request ER funds must be filed by the State Department of Transportation with the FHWA Division Office located in the State.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) has ongoing authority to conduct emergency repair and permanent restoration of damaged flood control works, which are those facilities constructed for the purpose of eliminating or reducing the threat of flooding. These include levees, floodwalls, flood control channels, and dams, among others.

Natural Resources and Conservation Service - Emergency Watershed Protection Program

The Natural Resources Conservation Service (NRCS) can provide assistance to areas that have been recently damaged by natural disasters through the Emergency Watershed Protection (EWP) program. The NRCS has the authority to remove debris from stream channels and implement conservation practices to mitigate excessive stormwater runoff and prevent excessive soil erosion. The NRCS EWP

program does not require a State or Federal disaster declaration; it is established and funded by Congress. In most cases, the NRCS EWP program will pay up to 75% of the cost of a project, with the remaining costs coming from local sources, and can be made in cash or in-kind services. In areas with limited resources as identified by U.S. census data, the program will pay up to 90% of the cost.

Department of the Interior – Bureau of Indian Affairs

The Bureau of Indian Affairs may help Tribal recovery after a disaster by providing resources, such as road maintenance grants. These must be coordinated with the FHWA and FEMA grant programs.

HOW DOES AN APPLICANT GET REIMBURSED?

For most Federal reimbursement programs, the applicant conducts a preliminary damage assessment and estimates the costs that will be required to restore the damaged facilities to their pre-disaster condition. They include the results of the damage assessment in a formal notice of the applicant's intent to request reimbursement provided to the Federal funding agency. This notice allows the Federal agency to allocate funds for potential reimbursement.

As the project progresses, the applicant maintains detailed documentation, as discussed previously. For debris operations, this includes timesheets; labor, fringe benefit, and equipment rates; equipment usage; awarded contracts; debris load tickets; debris operations reports; photographs; and other records. The detailed backup documentation is used to support development of the grant application. Depending on the program, the grant application may be completed based on estimates and then amended once final costs are known, or it may be submitted only after a final inspection has been completed and final costs have been tallied.

In most Federal grant programs, the applicant submits their completed grant application to the State. The State reviews the application for compliance with program requirements, and then forwards the completed applications to the Federal agency for processing. When the Federal agency processes the request, it releases the funds to the State, which acts as the administrator by disbursing and monitoring the grants awarded to the applicant under the program.

If the Federal agency rejects the grant application, the applicant has the right to appeal the rejection. Each agency and program has its own appeal process, and appeals must be made in a timely manner according to the requirements of the particular program.

- FEMA – The Grantee (State) first makes the appeal to the FEMA Regional Administrator within 60 days of receipt of notice of the action or decision being appealed. If the FEMA Regional Administrators uphold the rejection, the Grantee can make a second appeal to the FEMA Assistant Administrator at the Agency's Headquarters. This appeal must also be filed within 60 days following notice of the action or decision being appealed.
- FHWA – Appeals must be submitted in writing to the Division Administrator within 30 days of the initial finding of ineligibility.
- NRCS – Appeals are made to different committees or people depending on the type of program (Title XII or non-Title XII). If an agreement is not reached, mediation is an option. Finally, an appeal to the National Appeals Division can be made.

BEST PRACTICES

Government agencies and jurisdictions can better prepare for catastrophic events by implementing steps or best practices that would make the reimbursement process easier to complete. A few examples include:

1. Set up separate accounting codes for disaster-related work. This will help to separate emergency related work from all other types of work.
2. Keep track of equipment usage time with the respective equipment operator.
3. Create a separate file that includes all documents that would be used in the reimbursement program such as timesheets, equipment sheets, receipts, cost estimates, bids, and other records.

For additional guidance on debris removal and FEMA eligibility criteria, refer to FEMA 322 (Public Assistance Guide), FEMA 325 (Debris Management Guide), FEMA Policy 9523.13 (Debris Removal from Private Property), FEMA Policy 9523.11 (Hazardous Stump Extraction and Removal Eligibility), FEMA 9580.1 (Public Assistance Debris Operations Job Aid), FEMA Policy 9523.5 Debris Removal from Waterways, and FEMA Fact Sheet 9580.202 (Debris Removal Authorities of Federal Agencies).

Validity and appropriateness of best practices to be identified for inclusion in the handbook as it's developed.

LESSONS LEARNED

The Response to the 2011 Joplin, Missouri, Tornado – audits

Validity and appropriateness of lessons learned to be identified for inclusion in the handbook as it's developed.

TOOLS

FEMA 321, Public Assistance Policy Digest