E-Enterprise Scoping Report

Surveying and Assessing State Use of Electronic Permitting Systems

December 31, 2015

Table of Contents

[1 Executive Summary 1](#_Toc438220808)

[2 Defining ePermitting 2](#_Toc438220809)

[3 Current (Baseline) Status of ePermitting 4](#_Toc438220810)

[3.1 Review of State Websites 5](#_Toc438220811)

[3.2 Georgia EPD Survey of Current ePermitting status 6](#_Toc438220812)

[3.3 State Priorities for and Barriers to ePermitting Implementation 10](#_Toc438220813)

[3.3.1 Anticipated Future Enhancements to ePermitting Systems 10](#_Toc438220814)

[3.3.2 Key Barriers to ePermitting System Expansion 11](#_Toc438220815)

[4 Solutions Noted to Overcoming Barriers to ePermitting 12](#_Toc438220816)

[5 Outcomes and Savings from ePermitting 13](#_Toc438220817)

[5.1 Reported Benefits 13](#_Toc438220818)

[5.2 Broader Benefits 14](#_Toc438220819)

[5.3 Benefits and Costs of ePermitting: Empirical Data and Literature 15](#_Toc438220820)

[5.4 ROIs: Concept and Available Examples 19](#_Toc438220821)

[6 Conclusions and Recommendations: Options and Priorities for Considering Benefits and ROI   
for ePermitting Projects 20](#_Toc438220822)

[6.1 Recommendation: Identify ROI Framework for Evaluating Projects 21](#_Toc438220823)

[6.2 Recommendation: Develop Default Values and Methods to Facilitate State   
Calculation of ROIs 22](#_Toc438220824)

[6.3 Recommendation: Enable and Strengthen Continued State-to-State Learning 23](#_Toc438220825)

[6.4 Recommendation: Coordinate future ePermitting Efforts with related E-Enterprise Projects 23](#_Toc438220826)

[7 Bibilography 25](#_Toc438220827)

Appendix A: Participant List By Organization 26

Appendix B: Survey Instrument 27

# Executive Summary

E-Enterprise for the Environment is a new model for collaborative leadership among environmental co-regulators, engaging with all interested and affected parties, to achieve positive environmental, human health, and economic outcomes. E-Enterprise for the Environment simplifies regulations by streamlining and modernizing the implementation of our environmental programs.

Within the E-Enterprise initiative, EPA and the states work together to improve and streamline systems, leverage technology where useful and appropriate, and commit to joint governance to ensure adoptability of both technical and policy solutions. Consistent with these goals, states and EPA have been considering the use of electronic, web-enabled (i.e., online) systems, applications, and tools that can simplify and encourage compliance with environmental statutes and regulations.

In February 2015, the E-Enterprise Leadership Council identified ePermitting as one of several topics for additional scoping studies, and named co-chairs for the effort in the following months. The scoping study included a review of state implementation of applications to facilitate and manage the environmental permitting process, increasing the efficiency and effectiveness of applying for, reviewing, and obtaining permits for both the regulated community and the state staff that execute these processes. To examine this issue in depth, nine states and each of EPA’s program offices involved in permitting activities have formed a workgroup to study state experiences with these tools and applications, generally referred to as “ePermitting.”[[1]](#footnote-1)

This report documents the results of an investigation into the current status of ePermitting among state agencies, the priorities for and barriers to expansion of current ePermitting efforts, and options for documenting and assessing the costs and benefits (and return on investment, or ROI) for ePermitting projects. The data collection effort and analytical methodology employed for this included four steps:

* Initial research conducted by EPA to review and document high-level descriptions of ePermitting functionality of various states to support permitting processes for water, air, and waste programs. This effort also noted terminology used to describe existing state permitting process options;
* A targeted survey of state program staff conducted by the Georgia Department of Natural Resources (DNR), Environmental Protection Division (EPD) to more closely examine states’ current (“as is”) use of electronic systems across air, water and waste permitting programs. This effort examined both the extent to which systems support different functionalities (as laid out in Figure 1 below), and identified specific, self-reported system features, costs, limitations, and barriers to expansion;
* Supplemental interviews with state agencies to better characterize both the benefits of individual ePermitting efforts; and
* A review of key literature and existing studies to identify documented successes and frame options for measuring the impacts and benefits of future projects.

The report progresses as follows:

* **Section 2** defines ePermitting as a continuum of activities and systems; from simple to complex
* **Section 3** identifies the current state of technology among states that employ systems with ePermitting elements by summarizing Georgia EPD’s survey results
* **Section 4** identifies both the priorities expressed by states and the barriers to the broader adoption and use of ePermitting
* **Section 5** discusses the benefits, both realized and conceptual, of such systems
* **Section 6** outlines some initial approaches and information available to assist agencies in measuring the impacts (including the return on investment) of ePermitting projects

# Defining ePermitting

This report covers the following environmental permitting programs:

* “Title V permits” relating to Title V of the Clean Air Act for major sources of air pollutants;
* National Pollution Discharge Elimination System (NPDES) permits governing discharges of pollutants through point sources into water, consistent with the Clean Water Act;
* Permits for facilities that treat, store, or dispose of hazardous wastes (TSDFs), consistent with the Resource Conservation and Recovery Act (RCRA); and
* A variety of other permits required by EPA or by state environmental agencies, including, for example, construction permits near wetlands or registration of underground storage tanks, for which regulatory requirements can vary across states.

Current systems to support the development and review of permit applications vary significantly across states. Some of this is due to the delegated nature of many of EPA’s programs, and the fact that state systems have been designed to accommodate state as well as federal regulatory authorities over four decades of regulatory and technological evolution. In addition to differences across programs and state environmental statutes, individual state programs must often address other authorities (e.g., health and conservation) and incorporate (or centralize) business-related functionalities such as fee collection, work flow, and information technology strategies.

As a result, no single national system, electronic or otherwise, currently tracks the entire set of environmental permits that are applied for, reviewed, and approved across states and across statutes/environmental media. Instead, states use a variety of tools, applications, and other systems that have largely evolved independently of one another other to manage permit-related information for both regulated communities and state-level agency operations.

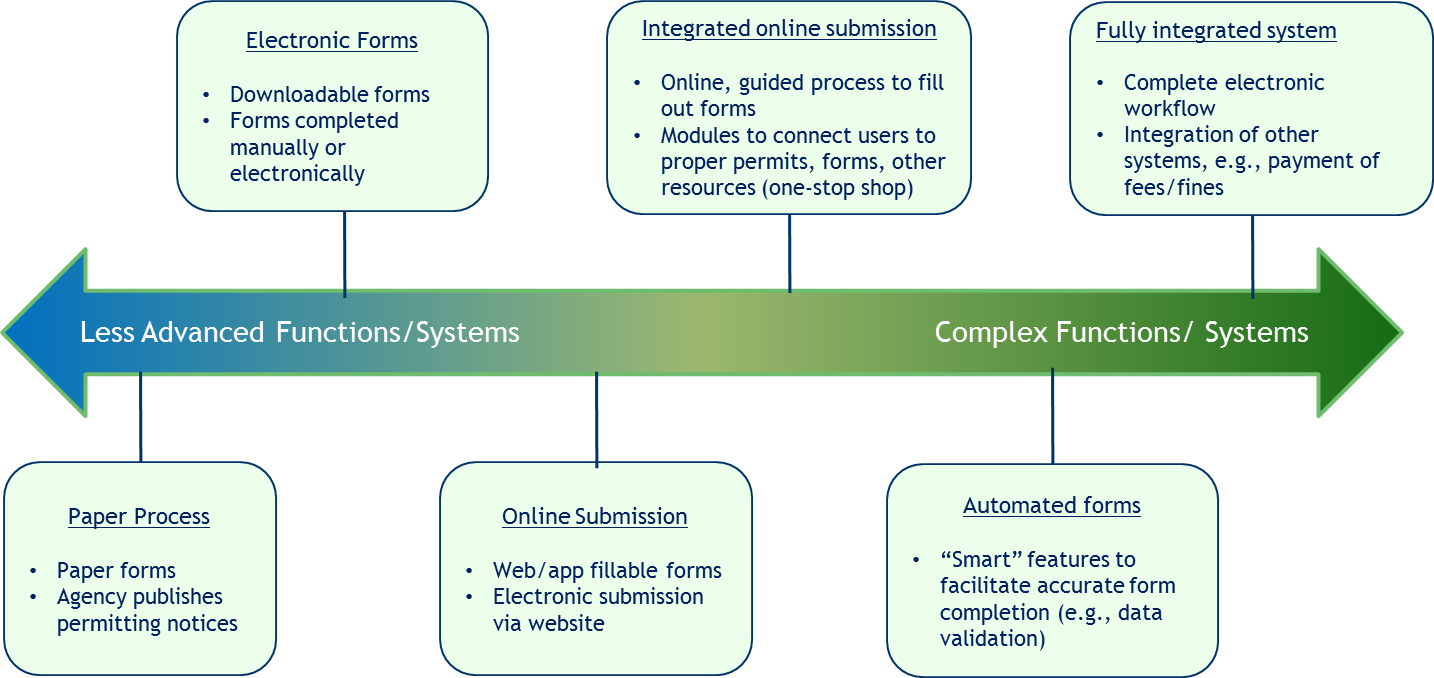
While most permitting functions originally involved an entirely paper-based process that predated Internet and even e-mail use, states currently support permit application, review, and renewal under different statutes using a variety of conventional (i.e., paper-based) and/or electronic systems to manage permitting workflows and processes.

**Definition:** The state/EPA workgroup defines ePermitting to include any tool, system, or activity that facilitates the permitting process through electronic means. Tools and applications that enable users to more efficiently, effectively, and/or accurately complete permit applications, and/or enable state program staff to better manage workflow, all represent aspects of ePermitting.

ePermitting can be viewed as a range of solutions; from simple functions such as enabling permit applications to be downloaded and/or scanned and uploaded as static files, to integrated systems that enable a fully electronic application through a web interfaces and provide information about permit review status and related information to applicants.

**Figure 1** below provides an overview of the ePermitting landscape as a continuum. Within the figure, more basic functionalities are included on the left-hand side of the gradient, while more complex modules, and sub-systems are included towards the right-hand side. In order of increasing use of electronic functionality, these are:

Figure 1. ePermitting functionalities and systems



* **Paper Processes:** Systems driven by or requiring that paper forms be filled out and submitted to agencies through mail, courier, or in person, and that correspondence and any payments be documented using paper. These systems may have electronic record-keeping systems relying on manual entry of information (e.g., when a permit is approved) but may lack other electronic functionality.
* **Electronic Forms:** Systems allowing an applicant to download forms from a web site, either to be printed and filled in or filled in electronically. These systems may also allow submission through e-mail attachments, but still require manual data entry into any recordkeeping systems maintained by the agency.
* **Online Submission:** Systems allowing an applicant to fill out an on-line application as a web-based form, and submit that form electronically (i.e., through a web site). These systems can still require that an applicant upload supporting documents, but general permit information is automatically recorded in a “back end” database throughout the process, eliminating the need for state staff to perform routine data entry and enabling a more rapid submission from the permit applicant.
* **Integrated Online Submission:** Systems providing cross-permit information and navigation support to applicants, as well as fully electronic submission.
* **Automated Forms:** Systems providing fully electronic submission with real-time “smart” features that support accurate form submission. These can include data validation steps (completeness and internal consistency checks) and interactions with existing datasets about applicants (e.g., autofill, address correction). These may or may not be combined with integrated on-line submission support, but represent interactive applications.
* **Fully Integrated Systems:** Systems that manage and record all aspects of the permitting process, including permit applications, agency workflow and review, information exchange with permit applicants, payment functions, and notifications. Ideally integrated systems incorporate integration features that provide “one stop” permit information and centralized coordination and data storage across permit types.

# Current (Baseline) Status of ePermitting

A critical objective of this scoping study is to document the current extent to which states have adopted electronic tools and systems to support air, water and waste permitting programs. This baseline assessment reflects three key information sources:

* An initial scan of state descriptions of web sites and permitting processes for water, air, and waste programs to explore both terminology used and specific functionality identified by state permitting process options;
* The Georgia EPD survey of state program staff to document states’ current (“as is”) use of electronic systems across air, water and waste permitting programs. This effort examined both the extent to which systems support different functionalities as laid out in Figure 1 above, and identified specific, self-reported system features, costs, limitations, and barriers to expansion;
* Workgroup discussions and supplemental interviews with state agencies to provide additional detail and key insights from their experiences adopting and expanding ePermitting functions.

Together these efforts describe the current ePermitting landscape, as well as insights into how states are planning for, or already implementing ePermitting systems, and the barriers to broader adoption of these systems that are critical. This baseline characterization is the first step to informing the desired “to-be” conditions, through understanding the technical, financial, or regulatory barriers to broader use of ePermitting systems, and the successful strategies that have been adopted in key states to address these barriers.

## Review of State Websites

In early 2015, EPA conducted initial research with the goal of documenting permitting process functionality available on state environmental and regulatory agency websites. This effort gathered information on the broad media types (e.g., air, water, waste, land) for which online permitting functionality was available on a state-by-state basis, and also examined the availability of some specific functions, such as electronic permit submittal and downloadable forms on these websites. Data collected was supplemented and verified by members of the working group.

Overall, this effort resulted in the following preliminary conclusions:

* State agency websites feature a variety of different permitting processes and protocols, which cannot always be readily categorized or cabined into discrete “types” of electronic permitting functions, and which reflect the range of ePermitting functionality outlined in Figure 1.
* Because many states do not centralize permitting activities and processes online, examination of agency websites does not necessarily provide a comprehensive landscape of the types of permitting processes available to the regulated community. In many cases, states may offer different electronic permitting functions for different permit or media types, and functions are not available in a centralized permitting portal or website, but instead on specific web pages.
* In some cases, electronic permitting functions are available only through registration or specifically-granted rights and privileges; this limited a comprehensive review of functions due to lack of access.
* The overall scope of electronic permitting assistance extends beyond a set of tools and applications that directly facilitate submitting a permit application, and includes other features such as direct online assistance, expedited permit renewal, online permit databases for public review, emissions and discharge inventories, and libraries of resources to assist the regulated community in compliance and permit-related matters.

In summary, the initial review identified the broad range of systems and tools in use across states; these systems often vary across agencies. Most states employ at least some electronic functionality, but these systems tend to very even within states by permit type, and some require registration. Centralized portals or entry points are still rare, suggesting that few systems are fully integrated across agencies.

## Georgia EPD Survey of Current ePermitting status

In August 2015, to verify and expand on the information assembled by EPA’s web review, the state of Georgia EPD developed and distributed a web-based survey to agency staff in all fifty states. To alert respondents to the survey and ensure reasonable response rates, Georgia’s survey effort used established information distribution channels including workgroups at Environmental Council of the States, the Exchange Network, and various E-Enterprise forums, as well as communities of practice defined by specific permit types (e.g., water and air).

The survey focused on four key areas. The first, current ePermitting efforts, aimed to identify the current status of systems that is the focus of this section. The other three focus areas, addressed in Sections 4 and 5 below, are:

* Priorities for implementing ePermitting in the near future;
* Barriers to implementing ePermitting; and
* Realized and anticipated savings from ePermitting.

The survey elicited 59 individual responses, representing 35 states. Of the total responses, 23 represented agency-wide information, and 36 reflected ePermitting practices at the program or permit level. Some states provided multiple responses that reflected both agency-wide and single-program information. The respondents are characterized as follows:

* 35 Unique states
* 32 Agency-wide responses or responses covering multiple programs
* 12 Water program-specific responses
* 5 Air program-specific responses
* 2 Land program-specific responses
* 4 Waste program-specific responses

These responses often included specific programs/reports, such as discharge reporting. For example, 25 responses incorporated NPDES-specific systems.[[2]](#footnote-2)

Across all responses the following themes emerged:

* 89 percent of respondents report at least some downloadable forms. While it is not possible to extrapolate this result to the states that did not submit responses, it is clear that the majority of states have adopted at least some level of electronic interaction with permit applicants.[[3]](#footnote-3)
* 33 percent of individual responses report an in-place system that manages work flow; this suggests that in ePermitting, states are seeking solutions that facilitate and improve both the permit applicant’s experience and agency operations.
* The majority of responses (including the cross-office and agency-wide responses) are focused on water and air program permits. While the responses do not provide reasons for this focus, published reports and interviews with agency representatives from Wisconsin suggest that a combination of features are responsible, including:
  + A high volume of relatively simple permits, such as wetland permits.
  + An established history of providing regular monitoring data as part of permitting, such as through NPDES permits and Air permits; this provides a basis for electronic interactions involving data.

In contrast, the more complex waste-related permits under RCRA may be difficult to homogenize within an electronic process, and may also be less common overall, and less frequently updated. As a result, the benefits of improving the permit processes for some of these less common permits may be more limited.

**Figure 2** and **Figure 3** below provide a visual overview of the current landscape of ePermitting systems as reported in Georgia EPD’s survey, both in total and specifying permit type. In these figures, survey results are arrayed along the general axis from less advanced ePermitting systems (e.g., fully paper or limited to downloadable manual forms) on the left, to more complex and integrated systems on the right.

While the scatterplot does not reflect a quantitative assignment of systems along the spectrum, the general groupings illustrate that, among respondents, a majority have moved at least some systems toward full integration. Data points clustered towards the left reflect those systems focused on downloadable forms which may be submitted electronically through email or uploads; data points clustered under the highest vertical part of the curve to the right of its midpoint reflect systems leveraging online fillable forms with data validation functions and additional features, such as workflow systems for regulators, integrated electronic payment systems, and/or publicly available searchable permit libraries. Not surprisingly, **Figure 3** shows that Agency-wide responses tend to document more integrated solutions, though this may reflect only the broader system understanding of the respondent and not the extent to which individual systems are integrated.

Figure 2. Complexity of ePermitting systems reported by respondents to Georgia EPD survey

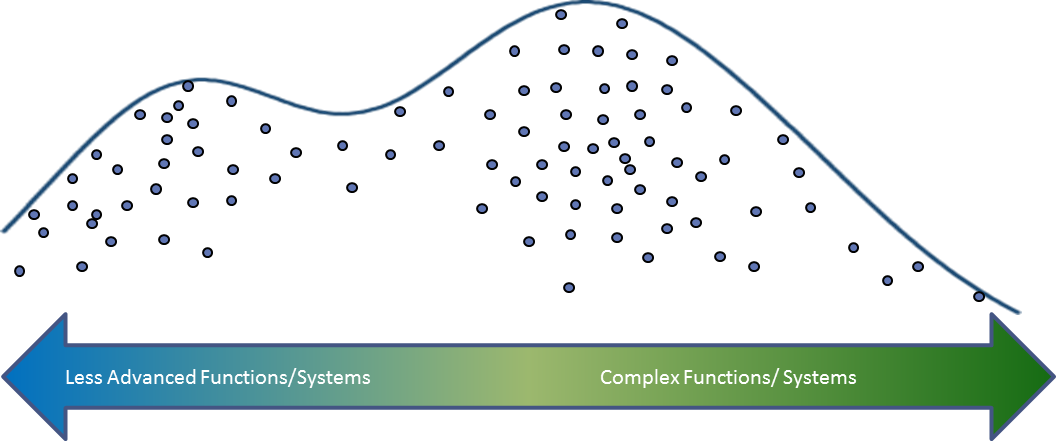
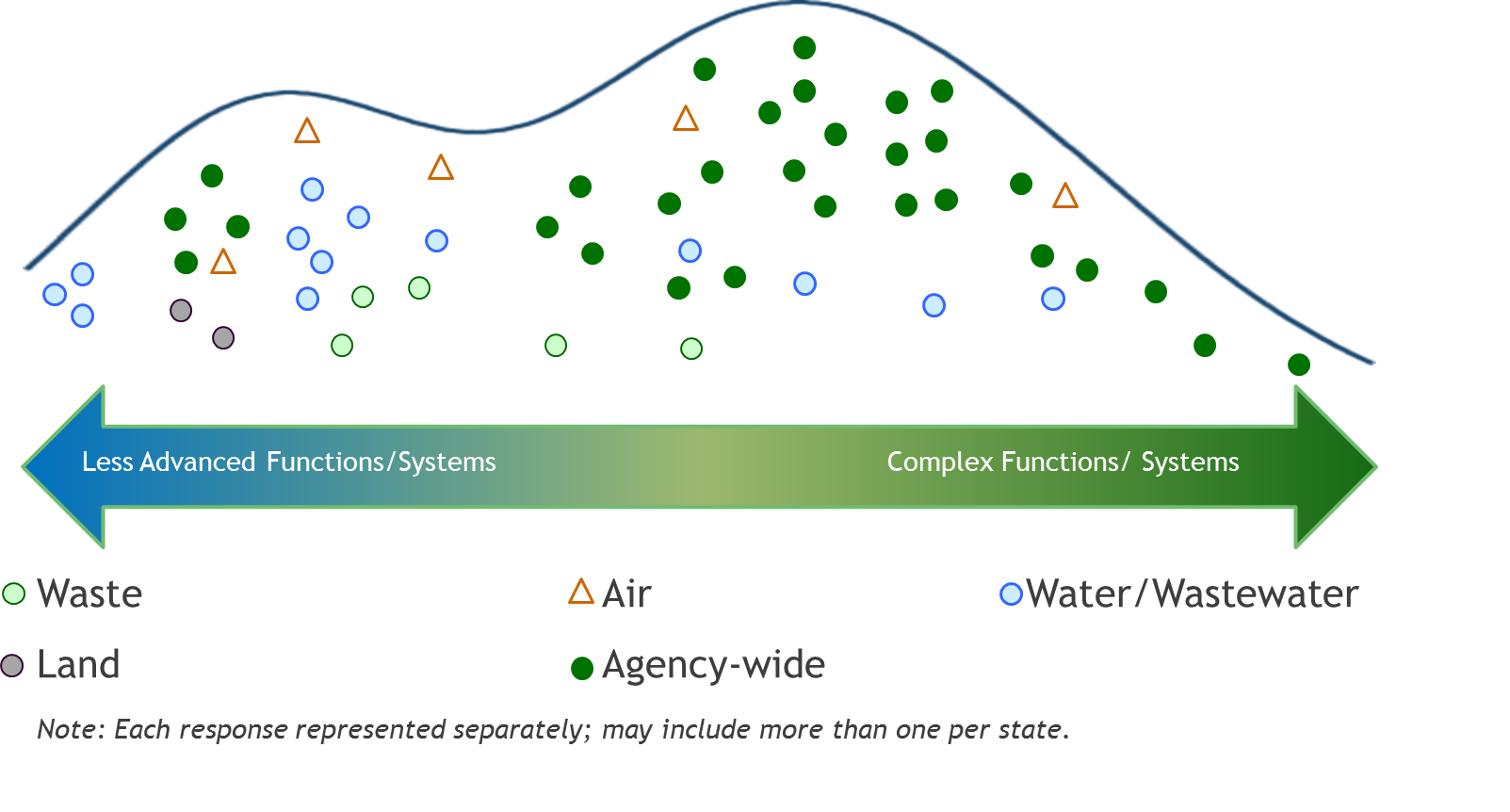


Figure 3. Complexity of ePermitting systems reported by respondents to Georgia EPD survey; sorted by respondent’s area of focus



The Georgia EPD survey also elicited information about the timing, cost, and design of existing systems. Overall, results reveal that:

* Among the 56 respondents who reported using ePermitting systems that involved any electronic components, 66 percent of these current systems have been implemented using a combination of state expertise and vendor support.[[4]](#footnote-4)
  + States named a limited number of vendors who appear to specialize in designing solutions for states; costs reported for vendor services range from $50,000 for a highly specific permit program in a small state including a wide range of functionality (i.e., inclusive of direct online submission, data validation, and integrated payment functions) to $3.5 million for a wide-reaching program in a large state that included all ePermitting functionality described above, including “one-stop shop” functions and a workflow system for state staff, with the exception of an application directly guiding users through the permitting process.
* 57 percent of respondents who identified the type(s) of software used to build their system report using a combination of commercial off-the-shelf (COTS) products and customized software to build their ePermitting systems.
* Development/implementation periods for ePermitting system development range from 10 hours to 10+ years, reflecting the breadth and size of systems. The shortest development times describe systems limited to downloadable forms, and the longest describe broad permit programs (e.g., all water-related permits for a state or agency-wide systems) with gradual, continual improvements, upgrades, and rollouts of new features and functions. Across the 27 respondents who provided cost information, the total spent to date on ePermitting systems is over $55 million. Additionally, 10 respondents provided state FTE resources devoted to ePermitting system development and implementation; per these respondents approximately 70 FTEs have been used toward ePermitting systems. These FTEs are additive to the $55 million in vendor costs.

In summary, the current state of ePermitting implementation reflects a considerable amount of institutional experience across states and programs, and includes some programs and states who have moved well into highly integrated systems. At the same time, a number of states have only limited electronic interfaces and functions. This suggests that efforts to share information across states may have significant value, both for states still at the initial stages of ePermitting implementation, and for states facing the challenges of fully integrating existing and legacy systems.

## State Priorities for and Barriers to ePermitting Implementation

In addition to documenting current state ePermitting practices, the survey conducted by Georgia EPD asked respondents to outline near-term priorities for implementing or expanding ePermitting functions, and also to identify the most important barriers facing ePermitting implementation.

### Anticipated Future Enhancements to ePermitting Systems

Among survey responses, the most common future enhancements to ePermitting systems identified were:

* Integrated Payment Systems that would enable completion of all financial transactions associated with permitting. (38 responses)
* Web/App Fillable Forms that would enable fully electronic permit applications, combined with data collection functions for the agencies. (37 responses)
* Workflow Systems that would allow both state and in some cases the permit applicant to manage and track the progress of a permit application or other permit-related transactions. (33 responses)
* “One stop shop” for linked forms that would simplify permit and compliance processes for applicants and other regulated entities whose operations require cross-program or multi-permit interactions. (22 responses)

Notably, these priorities were common regardless of the current level of system complexity reported by individual respondents, suggesting that states consider these areas to be places where paper processes or existing data management systems are not currently efficient, and perhaps where established and well-publicized technology solutions (in many cases COTS systems) are available. The exceptions to this pattern are the one-stop, cross-permit interface for permit applicants and workflow systems for managing permit-related transactions; the level of integration in these systems is almost by definition a state-specific, custom application, in part because it often requires new cross-program processes and the linking of disparate, sometimes legacy, data systems. These priorities were emphasized by states that already have adopted ePermitting solutions for some basic functions.

Other priorities mentioned by more than one state included expanding and refining available mapping and GIS functions and expanding current ePermitting systems to other permits or media.

A theme across survey responses is that, in addition to concern for timely and accurate data reporting, state ePermitting efforts center on effective business functions and agency operating requirements, such as the need to meet various open records mandates, fee collection, and workflow.

### Key Barriers to ePermitting System Expansion

Of the 59 responses that Georgia EPD received, 56 respondents named at least one barrier to adopting or expanding ePermitting. Unsurprisingly, as **Figure 4** below shows, the most common barrier noted was lack of funding for projects; over 80 percent of respondents cited this barrier. Roughly half of all respondents noted system complexity as a barrier as well.

Figure 4. Barriers to ePermitting implementation



Other noted barriers were fairly similar across responses, with roughly 20 – 40 percent of respondents flagging system transition, data coordination, legislative barriers, and organizational culture as barriers. A number of these barriers (particularly data coordination and system transition) are strongly related to both system complexity and cost. In addition, almost 20 respondents flagged “other” barriers; responses included CROMERR requirements, procurement process challenges, staff availability limitations, and long lead times to gear up for new projects.

**Barriers to ePermitting cited in Georgia EPD survey are similar to those in other industries:** A 2010 study of barriers to uptake of electronic records among physicians and nurses noted the following key barriers that limit physician use of electronic records:

1. Fear of crippling interruption to practice workflows;
2. Time required for training staff;
3. Concerns about interoperability;
4. Anticipation of a limited ROI;
5. Fear of losing professional autonomy;
6. Comfort-level, skill and experience with paper-based records.

Khangura, S., Grimshaw, J., & Moher, D. (2010). Evidence Summary: Electronic Health Records (EHRs). Ottawa Hospital Research Institute.

Of less concern to respondents were the challenges of selecting contractors to implement ePermitting systems, and difficulties related to lack of a framework for ePermitting, although at least one state reported that state-wide information technology procurement rules slow the process. Overall, however, this likely reflects the fact that most respondents have already undergone at least some planning and contractor-involved project implementation; as a result, these processes are either complete or relatively well established for many states.

While organizational culture was not ranked as the most significant barrier, comments from Wisconsin’s Department of Natural Resources suggest that a critical step in ensuring effective adoption of a broad ePermitting system – particularly one that addresses workflow – is aligning the culture and practices of the agency (or program) to support the new system. Particularly in larger states with regional offices, the recordkeeping and workflow processes associated with permitting can vary significantly, reflecting years of evolution in many cases. The adoption of a centralized system requires that first the various regions or programs or offices come to agreement on the anticipated new workflow. In some cases, this may represent a significant cultural and technical challenge.

**Technical obstacle**: An unanticipated issue arose at implementation as we learned that a majority of our audience, both public and government, utilized browsers that were not current (over three versions behind the most recent release). They were required to maintain an older browser version for various reasons, including compatibility with other government web applications. We found ourselves in the position of educating our audience on how web browsers work, the use of secondary web browsers, and the importance of keeping computers updated. Other government agencies cited additional restrictions related to aging equipment, software, and IT policies. - HI

# Solutions Noted to Overcoming Barriers to ePermitting

***Be prepared for the amount of time it takes to do this. – TX, WI, HI***

Some respondents noted specific solutions or instances where barriers to ePermitting were ameliorated. These included:

We highly recommend bringing state fiscal offices into the project as early as possible to establish electronic payment policies to support the acceptance and handling of online permit fees. This will also lessen the hurdle of training supporting fiscal offices in how permit application fees within the ePermitting system function and ease the transition for reconciling payments. - HI

* Conducting process improvements in advance of ePermitting implementation. In clearly mapping the permitting process and streamlining or creating efficiencies where possible, building an electronic system that operationalizes this process can be more effectively structured and results in fewer development challenges.
* Obtaining complete buy-in and direction from management and senior staff.
* In cases where multiple agencies, divisions, or other stakeholders are present and responsible for ePermitting system development and implementation, coming to agreement on long-term funding models and system ownership can streamline and expedite the process.

State personnel interviewed in Wisconsin, Texas, and Hawaii echoed these solutions, and noted that it is important to allot adequate time to plan the process and engage the people whose cooperation was critical for implementation. All stressed that for an ePermitting or related system to be successful, it is important to think through the processes and goals affected by the project prior to beginning any of the development efforts.

**Building on others’ experiences**: Our project team comprised 20+ supervisors and staff from various programs. We reviewed other states’ websites and forms (online and offline). We discussed web features that we liked and did not like. We benefited from others’ navigation design, web content, and form decisions. This process also led our group to the decision that downloadable PDFs were not enough. We made the commitment then to go further. - HI

# Outcomes and Savings from ePermitting

## Reported Benefits

Responses to the Georgia EPD survey, as well as a growing number of empirical studies from states that have implemented various systems related to or similar to ePermitting, confirm that ePermitting projects have had a range of positive impacts to state operation.

Respondents report both that they have already realized some ePermitting benefits/savings, and that they anticipate more. **Figure 5** provides a summary of the responses; well over half of respondents reported that they had either received or anticipated benefits, or both, reflecting the staged nature of ePermitting implementation.

Figure 5. Benefits realized and anticipated by states implementing ePermitting

Across responses, it is notable that average anticipated future savings were consistent regardless of the level of ePermitting that the respondents reported as already in place in their states. Realized savings, unsurprisingly, were lower for states reporting that their ePermitting systems are limited.

The responses reflect largely qualitative assessments, but predictably center around the most easily identified and measured changes in operation: fewer requirements for data entry and reduced demand for the physical resources (e.g., paper, postage, and file space) associated with paper-driven permit systems. One respondent noted a 50 percent reduction in paper use; another noted an equivalent of four FTEs able to focus on more productive tasks. Also commonly noted were a suite of benefits directly related to reduced manual data entry: reduced errors, data validation time, and data processing.

**Process improvement**: a single 35-page form was converted into a 2-page electronically fillable form that displayed only the specific questions relevant to the user. By streamlining and simplifying the process for customers, ePermitting improved compliance and built better relationships between the agency and its customers. - WI

Fewer respondents noted legacy system upgrades and workflow coordination as benefits; these responses generally align with the types of systems and functionality that respondents reported.

## Broader Benefits

Respondents also noted benefits that reach beyond the internal efficiencies of current system operations, toward more transformative changes in the relationship between agencies and the public. Benefits cited include enhanced compliance and enforcement, which, based on the experience of one state, can include improved participation and compliance among less sophisticated permit applicants, who might otherwise have developed an adversarial relationship with agencies through unintentional non-compliance. Benefits in these cases include not only improved environmental quality and more efficient use of enforcement resources, but a more positive basis for interaction between the agency and the public.

Waiting for documents to physically arrive represented half of the permit review window. When delivery became immediate, permit review time was cut in half, and staff could focus more on the science rather than the schedule during review. - WI

Similarly, respondents cited improved transparency and data management as a benefit; similar to compliance, accessibility of information can improve a range of interactions between agencies and the public that not only save time for all parties but improve the focus and tone of interactions.

Finally, one of the benefits noted by respondents is “faster turnaround” for permits. This often represents the removal of unnecessary delays associated with the need to move information from one person to another in a permit process. In some cases, according to anecdotal information from one state, permit timeframes were reduced by over 50 percent (as much as 50 days for complex permits, and 15 for simple permits) simply because information was instantly moved along the permit process as tasks were completed.

While this type of delay has little or no impact on the total work necessary at the agency to thoroughly review and complete the permit, it does have a significant impact on the ability of businesses and citizens to move forward with projects. The Massachusetts Department of Environmental Protection conducted a study that found that improving the management and turnaround of permits to move projects forward more quickly enabled millions of dollars of economic activity to be conducted sooner in the state, including the opening of new industrial and commercial facilities.

Prior to ePermitting, the permitting application process was referred to as a “block hole” as no one knew what happened to the application until there were questions or it was approved/denied. Now, the whole workflow process and the application’s status are visible by the application and our staff from the moment the applicant electronically submits the application. - HI

Staff turnover and retirement leads to losing a vast amount of knowledge; the new workforce only stays for three years. Processes must be able to speed that learning curve and transparently store knowledge. The systems have to change because the workforce is changing. - TX

Beyond all of these benefits, state agency representatives have also noted, both in responding to Georgia EPD’s survey, and in various contexts including interviews and working group calls, that additional but difficult-to-measure benefits would emerge from breaking down existing “silos” to ensure that agencies manage data effectively across both functions (e.g., permitting and compliance) and across media (e.g., air, waste, or water permits and environmental programs). Few, if any, states have implemented the fully-integrated ePermitting systems, as well as the other systems (e.g., enforcement systems) that would be necessary to fully eliminate siloed operations, but several states are focusing on this idea, and exploring the types of transformations and benefits (both within the agencies and with the regulated community) that might emerge.

## Benefits and Costs of ePermitting: Empirical Data and Literature

“Give the outside people the playbook” Tell them what we want from them. Use the system to show applicants how to make sure their applications are sufficient, and make this mandatory. When they push the button, the system will tell them what they need to include. - TX

The benefits associated with adopting ePermitting systems have been demonstrated broadly, through anecdotal, often qualitative descriptions of changes in practice and cost in states that have adopted ePermitting solutions. These success stories are increasingly supported by a body of broader literature that includes several high-profile rulemakings and studies of technology adoption in both environmental and other regulatory fields (e.g., health care). Similarly, states have been documenting the costs of various ePermitting and other information projects, and as projects continue through implementation information about project costs will improve.

Responses to Georgia EPD’s survey provided some basic cost information about ePermitting project implementation that emphasized (consistent with the wording of questions) the direct software and programming costs associated with designing and operationalizing the system. Responses also described a suite of benefits that are becoming increasingly well documented in both the arena of environmental protection and in other contexts as state and federal agencies have adopted electronic systems that govern standard interactions, workflow, and data management. A number of published studies of similar systems provide confirmation of the types and magnitude of the benefits expressed and anticipated by states implementing ePermitting. Examples of the benefits categories and metrics that have been quantified include:

Capital and implementation costs associated with ePermitting systems are generally well understood and as COTS products improve, software costs are becoming more predictable.

Less predictable costs noted by State agency staff in interviews and work group calls include:

* Employee training and transition costs associated with new systems and, in some cases, new technical skill requirements
* Ongoing annual costs associated with data management and storage
* “Learning curve” losses in productivity initially as staff learn new systems

Costs associated with resistance, either by agency staff or by permit applicants, to adopting the new system; persisting in older approaches can increase tasks needed and delay operations, offsetting potential gains in efficiency.

* **System efficiency benefits,** including avoided data entry, “paper management,” and materials costs. These benefits allow agencies to focus staff time on more productive activities such as substantive permit review.
* **Reduced costs associated with errors, manual review, and non-compliance:** These benefits also reflect some system efficiencies (e.g., reduced errors due to automated data entry and validation) but include process improvements that also affect permit applicants by avoiding unnecessary interactions and allowing agencies to improve enforcement targeting. These benefits are linked to the benefits of increased transparency and improved public trust.
* **Increased system participation** by both agency staff and the public can improve compliance rates and support a pattern of positive interactions that reduces the risk of costly and negative administrative and enforcement actions, while maintaining and improving environmental quality.
* **Reduced time to market for permittees:** Eliminating delays in physical transfer of information can both reduce turnaround time for permit review and ensure high quality review of applications. Reduced turnaround time allows businesses to begin operations sooner, and can add significant value to the state economy, particularly when permits are required for commercial or industrial operations to begin.

Below we note key examples of studies by states and other researchers that have quantified these types of benefits. Some are directly in the context of environmental protection and permitting, while others represent parallel benefits in fields such as health care.

**Quantified system efficiency benefits in other environmental and health care contexts:**

* **A study of the realized benefits of the Acid Rain/SO­2 System (2004)[[5]](#footnote-5)** documented benefits of the acid rain cap and trade system that were very similar to ePermitting options, including easier and more accurate tracking of emissions and compliance and ease of data verification and process. Notably, the study also focused on:
  + Improved public access to information that improved system credibility, and
  + Improved transaction speed. In 1995, the rules allowed up to five days to process records by mail, by 1997, EPA was processing 89% of the transactions in just 24 hours. Today, about 80 percent of transfers are entered online via the Web by the sources themselves.
* **Parallels in health care claims process.** A 2006 study of electronic health insurance claims systems quantified a number of efficiency gains that are consistent with changes in permitting processes under ePermitting. These include:
  + Adoption rates: Electronic submission of health insurance claims achieved 75 percent adoption in 2006, up from 44 percent in 2002.
  + Claim processing times: 98 percent of claims to be processed within 30 days of receipt.
  + Fewer errors and less need for additional information since electronic form prompts individual to submit everything at once.
  + Approximately two-thirds (68 percent) of all claims are now processed without manual intervention, increases of roughly 20 percent in four years.
  + The average cost of processing a clean electronic claim was 85 cents, nearly half the $1.58 cost of processing a clean paper claim. Pended claims requiring manual or other review cost $2.05 on average per claim to process.

**Reduced costs associated with errors, manual reviews, and incidental non-compliance**

In addition to the improvement in routine transactions and Agency operations, ePermitting systems that provide some data validation, and those that are used to inform compliance efforts, can improve the allocation of resources within agencies away from costly review and compliance assurance related to errors or unintentional non-compliance, and refocus agency efforts on addressing operations that pose environmental risks. [[6]](#footnote-6) These impacts do not reduce agency costs, per se, but improve the targeting and increase the effectiveness of limited enforcement resources. For the regulated community, elimination of errors can have significant cost savings, by avoiding time consuming documentation of operations and high-level management involvement that is needed to address compliance issues.

A key parallel to this dynamic is documented in the reduction of medical errors in the health care sector. A 2006 study by AHIP documents improvements in medical care stemming from electronic records, ranging from simple improved legibility of records, to avoiding potentially damaging clinical and medical errors.[[7]](#footnote-7), [[8]](#footnote-8) One key aspect of this improvement is the availability of data to a range of professionals for review; this is comparable to permit applicants, permit holders, permit writers, and agency enforcement staff all having access to the same clear information.

An additional benefit associated with reduced errors and compliance is the increase in public trust in data and in the agencies providing data.[[9]](#footnote-9) Tolbert and Mossberger (2006) find that improved government interactions through e-government at the local level led to increased trust in local government (though the impacts at state and Federal levels were less clear), and Bannister and Connolly (2011) argue that information and communications technologies (ICT) can facilitate transparency, which in turn increases trust in the government because it leaves less to trust. This has been borne out anecdotally by experiences in Ohio and Wisconsin, where improvements in systems and data accessibility have improved interactions with the public.

**Increased system participation by both agency and public**

Anecdotal information from states suggests improved compliance with procedural permitting requirements due to ePermitting options, in part due to the improved quality of information readily available to applicants about whether and how they should apply for permits. This type of improved compliance and participation is supported by data from other sectors, with one clear example emerging from the development of electronic tax filings. In states that provided electronic filing of both Federal and state income tax returned, participation in the Earned Income Tax Credit (EITC) was much higher, reflecting the benefit of both available instructions and ease of application.

**Reduced time to market: the benefit to permit applicants of quicker turnaround**

A comprehensive 2013 analysis by Massachusetts to consider the business case associated with a broad initiative that included ePermitting functionalities included a simple analysis that scoped the magnitude of economic activity affected by initial permitting delays to the operations of new businesses in the state as roughly $1,100 per day in net income and wages. Given permits for more complex projects that often have time frames of over 100 days, even modest improvements in permit processing time could enable the generation of millions of dollars of increased activity for states with large numbers of permits.[[10]](#footnote-10)

## ROIs: Concept and Available Examples

Of particular interest to many policymakers is the calculation of reliable “return on investment” (ROI) estimates for ePermitting projects that are contemplated. ROIs are attractive because they are simple in concept, using a formula that divides cost savings, time savings, and other benefits by total costs of the project. An ROI typically estimates benefits and costs annually, and marks the “payback period” beyond which, hopefully, benefits exceed costs. ROIs are also attractive because theoretically they can be used to compare the relative “profitability” of different projects.

A number of states have calculated ROIs for projects involving or similar to ePermitting efforts. Among these, two studies provide both data and methodological insights that could potentially be adopted by other states to use in adopting similar projects.

* Massachusetts Department of Environmental Protection’s 2013 Environmental Information and Public Access System (EIPAS) project examined improvement of permit and compliance structures across multiple state agencies, and calculated existing and anticipated benefits of $17-$24 million annually, emphasizing a broad range of quantified cost savings and benefits, including health benefits and market benefits of faster “time to market” for companies with more rapid permitting. The project had significant costs, but a payback time of fewer than six years, and increasing return on investment over time as adoption and system expansion took hold.
* Exchange Network Return on Investment (ROI) Study: One of the most comprehensive ROI studies to date, the 2006 Exchange Network Return on Investment and Business Process Analysis, examined the effects that Environmental Information Exchange Network technologies would have on the quality and efficiency of environmental data exchanges for states, tribes and local agencies. Five environmental data flows were included in the ROI analysis, including the Air Quality System, Resource Conservation and Recovery Act, Safe Drinking Water Information System, Toxics Release Inventory, and Electronic Discharge Monitoring Report. Four state agencies participated in this study, with each agency selecting three to four data flows to be analyzed out of the five flows included in the ROI. The agencies included the Michigan Department of Environmental Quality, New Jersey Department of Environmental Protection, Pennsylvania Department of Environmental Protection, and Washington Department of Ecology. The ROI analysis consisted of five steps that can be used as a consistent approach for assessing the ROI for any data flow. Overall the results from the study showed a positive return on most of the data flows analyzed, but variables such as volume of data being exchanged, pre-implementation business processes, and number of data flows used by each agency affected the ROI. A customizable ROI model, along with a user’s guide, accompanies the report.

# Conclusions and Recommendations: Options and Priorities for Considering Benefits and ROI for ePermitting Projects

The data collected for this effort provide a number of important insights into the current state of and future options for ePermitting across states.

* **ePermitting reflects a range of systems and tools** that have already been developed by states or are under development. The spectrum of ePermitting functions reflects everything from accessible, downloadable application forms to fully integrated systems that provide single-point interfaces for multiple permits, work flow, and payment.
* **Most states have incorporated at least some ePermitting functions** into their operations, but opportunities remain to expand and integrate systems, and to share approaches and lessons learned across states and agencies.
* **States cite a range of benefits, costs, and barriers that are consistent with those documented** in the literature and in prior studies.
  + Among recommendations for addressing barriers to ePermitting from state survey respondents is an emphasis on describing clear, improved processes and preparing and engaging staff.

A theme that emerges in the literature and is expressed in the barriers identified by respondents to the Georgia EPD survey is concern about the predictability of benefits and costs of systems. ePermitting solutions can be costly, particularly in early stages when learning is required, and organizations must undergo significant change and retraining. In this context, the inability of state agency staff to develop and present clear benefits can potentially limit support. As a result, it can be difficult for states considering ePermitting options to “make the case” for these projects due to limited information about costs and benefits.

Fortunately, the growing body of experience shared by the states that have begun implementation of ePermitting options can potentially assist future projects, both by providing insights that reduce costs and avoid difficulties, and by providing data that demonstrate benefits. This presents an opportunity for states to develop approaches for measuring costs and benefits of projects that will help support robust and efficient decisions about how best to incorporate ePermitting technologies into their programs.

## Recommendation: Identify ROI Framework for Evaluating Projects

The results of Georgia EPD’s survey and the review of the literature clearly demonstrate the potential benefits of well-conceived ePermitting programs. To support future decisions about how best to proceed, a clear next step is the development of a simple, robust ROI framework that leverages this experience and assists in identifying the best options. To be effective, an ROI framework should:

* **Rely on available data and/or well-documented impacts**
  + Where project-specific cost, timing, and impact data are uncertain, states can examine published studies to identify comparable project descriptors.
* **Capture the most critical benefits associated with ePermitting** 
  + This includes benefits both to the agency itself and to permit applicants and other affected members of the public.
* **Present a range of scenarios that considers business risks and unanticipated benefits.**

The literature outlined above, coupled with input from states on ePermitting experiences, suggests that the following suite of metrics could be incorporated into an ROI without significant primary data collection on the part of states. Examples from a brief literature review are summarized in **Figure 6**.

Figure 6. Potential ROI metrics

| **Metric** | **Potential Impact** | **Availability and Current Research** |
| --- | --- | --- |
| Change in materials use | Varies with process; can be significant | * Good: Materials often tracked (supply purchase, postage, square feet needed) * **Literature:** Good: many examples |
| Change in data entry, and validation through different data submission | Potentially significant; agency processes and coordination with applicants | * Accessible with internal effort: should be part of process definition before ePermitting project is implemented * **Literature (as back-up):** Good: many examples |
| Avoided errors and complaints | Potentially significant; coordination with applicants, public, enforcement, media | * Accessible with internal effort: may require coordination with agency departments, review of number of incidents, time impacts * **Literature:** Limited (because varies with organization) but general costs per hour can be estimated for public, applicants, for time required based on state estimates |
| Reduced Environmental Impacts | Potentially significant to public | * Requires estimate of improved compliance * **Literature:** Value of avoided emissions, other impacts well documented |
| Reduced Time to Market for Applicants | Significant to regulated community and public | * Requires estimate of potential reductions in permit review time * **Literature:** Screening methodology using average company revenues may be applied using public data |
| Reduced Costs associated with public information requests | Potentially significant to state and public (when applicable) | * Requires estimate of time needed to respond to information requests, costs of shipping, as well as system specifications on delivery. * **Literature:** Standard costs; can be extrapolated to public |
| Project Costs | Significant to state | * Need estimates of: development, purchase, training, and maintenance costs; adoption rates (both internal and external) * **Literature:** Examples available to support ranges if state estimates are not complete |

While the metrics in Figure 6 are by no means comprehensive, they represent a subset of the most well-documented, often-repeated impacts that are associated with ePermitting and similar system efforts, and they extend beyond “traditional” ROIs in considering benefits that reach beyond narrow “cost savings” to state Agencies. Poorly-measured ROIs can emphasize time saved as “avoided costs” when improved systems often both allow and require (e.g., through increased volume) that staff time no longer wasted on low-value tasks be redirected to more productive functions.

## Recommendation: Develop Default Values and Methods to Facilitate State Calculation of ROIs

In developing and applying an ROI framework like the one outlined above, one key step could be to develop a standard method of calculation and identify accepted approaches for valuing key variable. For example:

* Cost components should incorporate comparable approaches to calculating time frames for implementation, discounting, and efficiency losses associated with initial “learning curves.”
* State and private sector labor rates should rely on a consistent approaches and assumptions based on Bureau of Labor Statistics or other public sources, where state data aren’t available.
* Environmental benefits such as avoided health effects should incorporate accepted economic values such as EPA’s value of a statistical life (VSL).
* Time to market estimates should reflect a standard methodology.
* Sensitivity analyses should be routinely conducted using consistent methods to consider scenarios in which costs or benefits are higher or lower than expected.

For all of these parameters, well-established methods and data are readily available and can be adapted with relative ease to help simplify evaluation for state and cross-state projects.

## Recommendation: Enable and Strengthen Continued State-to-State Learning

Responses to the Georgia EPD survey identified some opportunities for data sharing that could potentially reduce costs for each participating organization. A platform for sharing best practices, design approaches, technology options and reviews and pitfalls to be avoided could provide considerable value both within agencies and across states. Potential structures include:

* Formation of a workgroup of States to develop business requirements for e-Permitting systems. The results of this workgroup could be included in the Iowa toolbox project. An example of a toolbox item is Shared CROMERR services for paperwork reduction and signatory requirements.
* Creation of an information clearinghouse for States to submit and review knowledge items such as bid packages, approved CROMERR applications, business workflows, survey results and other items that would benefit E-Permitting efforts.
* Foster user groups of States are that working with common vendors for development of e-Permitting systems to promote development of modular, reusable system components.

These resources could enable states that develop transferrable methods or tools for ePermitting implementation to assist other states in both reducing costs (either within agencies or across states), and documenting the benefits of their efforts as systematically as possible.

## Recommendation: Coordinate future ePermitting Efforts with related E-Enterprise Projects

As ePermitting efforts gain sophistication across states, other areas of focus under E-Enterprise will become increasingly relevant, and coordination with these efforts – particularly, in the near term, with the Facility Identifier (FRS) and the Portal projects – may be of value.

* The FRS project aims to enable facility configurations to be reported directly to a master database that can be linked to EPA programs and State systems, to help reduce overlapping or redundant facility reporting requirements, and align facility data across regulatory programs. To the extent that facility configurations and changes in these affect permits, coordination with this effort could be useful.
* The E-Enterprise Portal is designed to be used to query the master facility database as well as give facilities a “one stop shop” for compliance activities. Designing this portal to support flows to and from relevant permitting information and interfaces could support ePermitting efforts.

To the extent that these efforts intersect with one another, ensuring alignment through collaboration can improve outcomes across efforts.

Taken together these recommendations can provide a resource both to support rapid measurement of the results of ePermitting efforts (both existing and planned) and to ensure that systems are benefitting from best practices and design features that have been tested and proven successful by others.

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**Appendix A: Participant List by Organization**

Scoping Team Members:

Co-Chairs: Mary Walker/GA

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EPA:

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Karen Baldwin/VA

Fred Cunningham/VA

Sue Battle-McDonald/MD

Renee Alonso/GA

Angela Ivester/GA

Regina Crolley/SC

Greg Aldrich/OR

Beth Graves/ECOS

**Appendix B: Survey Instrument**

Identification:

Submitting for a specific area or for the agency as a whole?

Name/E-mail Address/Phone Number

1.a Currently have or use the following:

Forms in PDF Word or other format available online for download

Web or app-based fillable form

Submission of downloaded forms via email or online upload

Submission of web or app-based fillable form directly (without needing to print PDF or email)

Online guided process to fill out web or app-based forms (e.g. interview-style questionnaire similar to TurboTax)

For online forms use of “smart features” to auto-populate or verify fields or check completion (data validation)

Payment system integrated with permitting system

Workflow system for permitting with reminders for both regulated community and regulators

Permits available online in a searchable format for public review

State agency website used to publish public notices of permitting activity

Linking of online forms to separate modules for completion of all related documentation (i.e. “one stop shop”)

Other relevant permitting materials are available online (e.g. Title V Statement of basis or application)

2b. Which specific types of permits or other regulatory/compliance submissions are handled by the ePermitting system?

Air

Water

Land

Waste

Other – describe

3a If you selected any of the above in Question 1, were these systems or functions implemented by State staff or by an outside contractor?

3b. If "State staff" or "both", what was the approximate time frame of State resources expended to implement these systems/functionalities?

3c. If "State staff" or "both", what was the approximate level of effort of State resources expended to implement these systems/functionalities?

3d. Which contractor or contractors assisted the State in implementing these systems/functionalities?

3e. If "Outside vendor" or "both", what was the approximate time frame of contract resources expended to implement these systems/functionalities?

3f. If "Outside vendor or "both, was commercial off-the-shelf (COTS) software acquired, or customized commercial software?

3g. If "Outside vendor" or "both", what was the approximate cost to implement these systems/functionalities? If possible give separate amounts for each discrete project.

4. Which of the following system types or functionalities is your State looking or working to implement in the near future? (Select any/all that apply)

Forms in PDF Word or other format available online for download

Web or app-based fillable form

Submission of downloaded forms via email or online upload

Submission of web or app-based fillable form directly (without needing to print PDF or email)

Online guided process to fill out web or app-based forms (e.g. interview-style questionnaire similar to TurboTax)

For online forms use of “smart features” to auto-populate or verify fields or check completion (data validation)

Payment system integrated with permitting system

Workflow system for permitting with reminders for both regulated community and regulators

Permits available online in a searchable format for public review

State agency website used to publish public notices of permitting activity

Linking of online forms to separate modules for completion of all related documentation (i.e. “one stop shop”)

Other relevant permitting materials are available online (e.g. Title V Statement of basis or application)

5a. If you selected any of the above in the previous question, are these systems or functionalities being developed and/or implemented by State staff or by an outside contractor?

5b. If "State staff or both", what is the expected timing and level of effort/State resources required to implement these systems/functionalities?

5c. If "State staff or both", what is the expected time frame of State resources required to implement these systems/functionalities?

5d. Which contractor or contractors is assisting the State in implementing these systems/functionalities?

5e. If "Outside vendor" or "both", what is the expected time frame to implement these systems/functionalities?

5f If "Outside vendor or "both, was commercial off-the-shelf (COTS) software acquired, or customized commercial software?

5g. If "Outside vendor" or "both", what is the expected cost to implement these systems/functionalities?

6a. Are there any systems or functionalities regarding ePermitting that the State would like to implement, but has not yet been able to do so?

If "Yes", please describe the systems or functionalities you have not been able to implement.

6b. What are the major barriers faced by the State in implementing additional ePermitting systems/functionalities?

Funding (lack of financial or staff resources)

Complexity (lack of skilled subject matter and technical resources

Difficulty in transitioning away from current/legacy systems used by State

Substantial challenges in coordinating data types and formats across programs

Other barriers – describe in more detail

Organizational culture

Unique legal constraints and / or legislative barriers

Lack of blueprint or framework to use to begin or plan process

Difficulty to find/select proper outside contractor

Grand Total

7. Has any process improvement analysis or process improvement efforts been completed in support of or prior to any efforts? Examples of process improvement efforts include mapping current processes through a flow chart or swim lane diagram; determining cost and quality metrics for sub-processes; assessing root causes for ineffective processes; impact studies of the people most affected by the process - what do they think? Assessing what other teams or organizations have done; engaging external process improvement expertise.

8a. Actual Savings: Has the state experienced any of the following savings or benefits since it implemented any of the ePermitting systems/functionalities discussed above?

Less time spent by State staff on entering data

Fewer physical resources consumed (e.g. paper)

Fewer errors present in data leading to less time spent by State staff on follow-up and correction

Less time spent by State staff on other data processing tasks

Less time spent by State staff validating existing data

Legacy systems upgraded to more efficient and effective systems

Faster approval for external operations

Less internal coordination for workflow required

Other – describe in detail

Environmental benefits – describe in detail

8b. If you answered affirmatively for the previous question, estimate the magnitude of the savings experienced, in total hours (per day, month, week, year, etc.) saved.

8c. If you answered affirmatively for the previous question, estimate the magnitude of any other quantifiable savings experienced beyond those reflecting hours saved, e.g., resource savings, cost savings, increased compliance, etc.

8d. If you answered affirmatively for the previous question, what anecdotal, non-quantifiable, or broader benefits have been noted.

9a. Anticipated Savings: For the systems/functionalities that the State is currently implementing, will be implementing in the near future, or would like to implement as discussed above, which of the following savings are expected to occur?

9b. If you answered indicating that savings are expected to occur in the previous question, estimate the magnitude of the savings experienced, in total hours (per day, month, week, year, etc.) saved.

9c. If you answered affirmatively for the previous question, estimate the magnitude of any other anticipated quantifiable savings that will be experienced beyond those reflecting hours saved, e.g., resource savings, cost savings, increased compliance, etc.

9d. If you answered affirmatively for the previous question, what anecdotal, non-quantifiable, or broader benefits do you expect to attain?

For any implemented or in-progress system, is the system CROMERR compliant?

For any implemented or in-progress system, does the system use the CROMERR signature authentication shared service?

Are there any applications or services that could be shared with other states?

Comments related to sharing of applications and services

1. The nine states on the work group for this pilot include Georgia, Virginia, Delaware, South Carolina, Maryland, Arkansas, Iowa, Oregon, and Ohio; EPA’s permitting program offices include Office of Water, Office of Air and Radiation, Office of Solid Waste and Emergency Response, and the Office of the Chief Financial Officer. [↑](#footnote-ref-1)
2. Taken together, the responses to the survey provide broad information about the state of ePermitting and emerging state priorities and barriers. Definitive quantitative analysis of survey results is limited due to data limitations common among survey responses, including: inconsistencies across responses (e.g., program-level responses that differ from agency-level responses in the same state), incomplete responses, and potential for double counting in states that provided both program and agency-wide responses. These limitations are considered where relevant in the qualitative analyses in this document, and do not present significant constraints in qualitative analysis. [↑](#footnote-ref-2)
3. Each response is represented separately; may include more than one per state. Fifteen states did not have any responses to the survey. EPA’s initial review of state websites (see Section 3.1) indicates that these states are generally similar to states with one or more survey respondents with regard to ePermitting. Specifically, six of these 15 states have downloadable forms, another five states have downloadable forms and/or additional functions as online, and an additional two states had more complex ePermitting systems with direct electronic submission and additional features, though these systems were limited to specific permit types and not state- or agency-wide. EPA’s review of state website did not yield any specific ePermitting system information for the remaining two states. [↑](#footnote-ref-3)
4. In general, respondents who indicated any electronic functionality had both downloadable forms and at least one other component, such as a publicly viewable permit library, an integrated payment system, or at least something where the agency website published permitting notices. In these cases, vendors were generally involved. The five respondents who did not note use of vendors described systems with downloadable forms (5), email/upload submission 94), fillable online form (1), TurboTax process (1), public permit library (1), other help available online (1) and permit notices published online (5). So generally, but not always, vendors are involved when systems are complex, particularly direct submission, one-stop shop, data validation, workflow systems, payment systems. [↑](#footnote-ref-4)
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