

STRATEGIC OPTIONS OF INVENTORYING AND UPDATING ENVIRONMENTAL GUIDANCE AND LINKS

Final Report

Prepared for:

National Cooperative Highway Research Program

Prepared by:

Shannon Cox, Steven Ziegler, Christy Corzine, Kimberly Stevens,
Sharon Hoepker, and Steven Keith

ICF International
9300 Lee Highway
Fairfax, Virginia 22031

July 27, 2012

The information contained in this report was prepared as part of NCHRP Project 25-25, Task 77, National Cooperative Highway Research Program.

SPECIAL NOTE: This report **IS NOT** an official publication of the National Cooperative Highway Research Program, Transportation Research Board, National Research Council, or The National Academies.

Acknowledgements

This study was conducted for the National Cooperative Highway Research Program (NCHRP) Project 25-25(77), *Strategic Options of Inventorying and Updating Environmental Guidance and Links*. The NCHRP is supported by annual voluntary contributions from the state Departments of Transportation (DOTs). Project 25-25 is intended to fund quick response studies on behalf of the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on the Environment. The report was prepared by ICF International. The work was guided by a technical working group. Work group members included: Kelly C. Dunlap, Diane Madden, Jennie Ross, Vicki Steigner, Sandra L. Tucker, Kenneth Winter, Carol Braegelman, and Jillian Barber. The project was managed by Nanda Srinivasan, NCHRP Senior Program Officer. In addition, NEPA managers and practitioners at state DOTs and federal agencies, as listed in Appendix B, participated as interviewees.

Disclaimer

The opinions and conclusions expressed or implied are those of the research agency that performed the research and are not necessarily those of the Transportation Research Board or its sponsoring agencies. This report has not been reviewed or accepted by the Transportation Research Board Executive Committee or the Governing Board of the National Research Council.

TABLE OF CONTENTS

Summary	iv
Background	1
Research Approach	1
Review and Inventory of NEPA Guidance Materials	1
Identify State Department Practices of Maintaining and Sharing NEPA Guidance	3
Develop and Suggest Approaches for Sharing and Maintaining NEPA Guidance Materials.....	4
Findings and Applications	5
Results from Interviews	5
Current Practices	5
Successes.....	6
Challenges	7
Recommendations from Interviewees.....	7
Summary of Interview Results.....	9
Recommended Strategies for Sharing, Updating, and Maintaining NEPA Guidance Materials	10
Strategy #1 - Glossary.....	15
Strategy #2 - Technical Training	15
Strategy #3 - Distribution List of Users	16
Strategy #4 – Formal Process & Tools for Maintaining and Updating Web-Based NEPA Guidance Materials	17
Strategy #5 – Publish Announcements and Changes via RSS	21
Strategy #6 – RSS Aggregator	24
Strategy #7 – Semantic Coding of Web Pages.....	26
Strategy #8 – Expanded Use of Existing Reference Websites.....	33
Strategy #9 – Persistent Uniform Resource Locators	35
Strategy #10 – Internal Search Engine Optimization.....	38

Strategy #11 – Modern Techniques to Highlight Content Updates	42
Strategy #12 – Centralized Search Site	49
Conclusions and Suggested Research	52
Glossary of Terms	54

LIST OF APPENDICES

Appendix A. Inventory of State Department of Transportation NEPA and Related Guidance Materials

Appendix B. Interview Notes

SUMMARY

The purpose of National Cooperative Highway Research Program (NCHRP) project 25-25 Task (77) is to provide the transportation community with a better understanding of the range of NEPA guidance materials developed at the state levels, current practices for maintaining and sharing these materials, associated challenges, and recommended strategies.

Through web-based research and outreach to state DOTs, the research team developed an inventory summarizing the topics and formats, along with URLs if applicable, of NEPA guidance materials for 42 states (see Appendix A). The team conducted telephone interviews with NEPA materials managers and users in 14 DOTs and 3 federal agencies to identify: successes for maintaining and sharing NEPA guidance materials, challenges of maintaining and sharing NEPA guidance materials, and recommended strategies.

In summary, all of the successes cited were a result of developing electronic systems for maintaining and sharing NEPA guidance materials, including implementing a web-based system. Interviewees also cited several common themes related to the challenges of using, maintaining, and updating the NEPA guidance materials and websites, as well as some challenges with sharing and accessing materials from other state DOTs' and federal agencies' websites. The table below summarizes the success and challenge themes that were captured. The themes are listed in the table, ordered by the frequency state DOTs noted the success or challenge during the interview, as indicated by the number included in parenthesis.

Table 1. Summary of Key Success and Challenge Themes

Successes for Maintaining and Sharing NEPA Guidance Materials (Number of State DOTs)
<ul style="list-style-type: none"> • Online guidance is readily accessible (7) • Can hyperlink to other policies, regulations, and guidance materials (7) • Website provides an overview of agency practices (4) • Online guidance is used more often and is easier to use (4) • Online guidance can be updated in one location (4) • Website provides a means of receiving notification of broken links or out of date material (3) • Agreed upon materials provide forum for conflict resolution (1) • Website provides means of getting comments on draft guidance materials (1) • Use of a glossary of terms promotes usefulness of search function (1) • It is good place to capture agency "knowledge" all in a single location (1)
Challenges of Maintaining and Sharing NEPA Guidance Materials (Number of State DOTs)
<ul style="list-style-type: none"> • Finding resources/personnel with the time to make the updates/revisions (9) • Keeping guidance up to date, including websites (7) • Additional time needed to coordinate with IT support (5) • The amount of time required to keep hyperlinks up to date (5) • Lack of consistent/easy way to keep practitioners informed of updates and revisions (4) • Electronic system/website is ever-expanding - - always more to maintain and keep updated (3) • Each PDF document has to be searched and updated separately if not part of a "live" site (1)

<ul style="list-style-type: none">• Maintaining separate or tailored guidance for different regions (1)
Challenges Associated with Accessing other Agencies' Guidance Materials (Number of State DOTs)
<ul style="list-style-type: none">• Different organizational structures and updating websites frequently can make materials difficult to find (3)• Search functions don't always work as expected (1)• Different uses of terms and acronyms can make it difficult to find what you are looking for (1)

The research team identified and explored strategies to address the common challenges identified by state DOTs. Information summarizing the challenges addressed by each strategy is provided in Table 2. The level of effort to implement and maintain each strategy, along with the expected benefits, and recommendations for a primary implementing agency or organization are summarized in Table 3. This is meant to be a general and high-level summary – both the level of effort and resulting benefit would vary according to the specific circumstances of each agency and strategy. The detailed descriptions provided for each strategy in the body of the report include an explanation of how the strategy works, a supporting example, a qualitative assessment of how readily it might be implemented, and its advantages and disadvantages.

Table 2. Matrix of Challenges and Strategies for Updating, Sharing, and Maintaining NEPA Guidance Material

STRATEGIES	CHALLENGES ADDRESSED																		MATERIAL TYPES SUPPORTED			
	Challenges Identified in Interviews															Other Challenges						
	Keeping guidance up to date, including websites	Lack of resources	Informing users of updates	Educating new users	Coordinating with IT support	Unfamiliar Technology	Searching PDFs	Updating PDFs	Updating hyperlinks	Updating guidance kept in multiple locations	Making quick updates	Maintaining tailored guidance	Search functions	Finding materials online	Different terms	Siloed searches across agencies	Lack of knowledge about existing tools/sites	Lack of connectivity between existing tools/sites	Internet Site	Intranet Site	PDF	Word Processing Document
1. Glossary				X			X						X		X				X	X	X	X
2. Technical training	X	X		X	X	X					X								X	X		
3. Distribution list			X	X															X	X	X	X
4. Formal Process & Tools	X	X	X		X			X	X	X	X	X							X	X	X	X
5. Really Simple Syndication (RSS)			X											X					X			
6. RSS Aggregator			X	X									X	X			X		X			
7. Semantic Coding			X	X			X						X	X	X	X	X	X	X			
8. Expanded use of Existing Reference Websites			X	X									X	X		X	X	X	X			
9. Persistent URLs	X								X				X						X			
10. Internal Search Engine Optimization													X	X					X			
11. Modern Techniques to Highlight Content Updates	X		X	X	X									X					X	X		
12. Centralized Search Site			X	X									X	X		X	X	X	X			

Table 3. Matrix of Level of Effort to Implement and Maintain Strategies for Updating, Sharing, and Maintaining NEPA Guidance Material and resulting Benefits

STRATEGIES	Level of Effort		Expected Benefit		Implementing Agency			Explanation
	To implement strategy	To maintain strategy	Ability to increase the efficiency of maintaining and sharing material	Ability to increase the efficiency of finding material and staying current	DOT	National level	Other	
1. Glossary	Low	Low	Low	Medium	X			Developing and maintaining a glossary requires no IT support. The primary purpose is to help users understand agency-specific terminology to increase their ability to find and understand material. Terminology is often agency-specific and best defined at the DOT level. The strategy could be used in combination with other strategies, such as Centralized Search Site (#12).
2. Technical training	Med	Low	High	None	X			Technical training for subject matter material managers focused on simple, ongoing, or repetitive tasks typically performed by an IT expert could increase the efficiency of updating and maintaining materials. It would require some level of effort to develop and initiate the training, but then could become routine. This strategy is best implemented by individual DOTs for their specific processes and software.
3. Distribution list	Low	Low	High	High	X	X	X	Creating an email distribution list of users would require a relatively low level of effort. It would help material managers inform users of updates and help users stay current. Individual DOTs would primarily implement this strategy; however, it could complement other strategies including an RSS Aggregator (Strategy #6) or Expanded use of Existing Reference Websites (Strategy #8).
4. Formal Process & Tools	Med	Low	High	None	X			This strategy encompasses a range of processes and tools directed at making it easier for materials managers to keep content current. The

STRATEGIES	Level of Effort		Expected Benefit		Implementing Agency			Explanation
	To implement strategy	To maintain strategy	Ability to increase the efficiency of maintaining and sharing material	Ability to increase the efficiency of finding material and staying current	DOT	National level	Other	
								levels of effort required to implement and maintain these processes and tools ranges – but are generally low to medium. Once in place, this strategy can increase the efficiency of maintaining and updating content.
5. Really Simple Syndication (RSS)	Med	Low	Medium	High	X	X	X	Implementing RSS requires some IT support, but is not a highly technical or expensive strategy. Once in place, it is easily maintained. RSS is an easy way for material managers to keep their users up to date. RSS would be implemented on individual DOT pages. It could also be used to complement the Expanded use of Existing Reference Websites (Strategy #8).
6. RSS Aggregator	High	High	High	High	X	X	X	Since this strategy requires the development of a website, the implementation and maintenance efforts are high. While the site would likely be owned and operated by a national organization, the aggregator would require participating DOTs to establish RSS feeds. It would provide an excellent way to share and stay current on updates and new materials across the country.
7. Semantic Coding	High	Med	Low	High	X			Semantic coding requires adding microformats to existing and new web material. This is a relatively new strategy and, initially, would require a high level of IT effort. The outcome would be powerful search results using common engines like Google and Bing, creating a high added value for material users.
8. Expanded use of Existing Reference	Low	Low	Medium	Medium	X	X	X	This strategy does not require the development of a new website, rather leverages existing sites. Implementation mainly involves the ongoing

STRATEGIES	Level of Effort		Expected Benefit		Implementing Agency			Explanation
	To implement strategy	To maintain strategy	Ability to increase the efficiency of maintaining and sharing material	Ability to increase the efficiency of finding material and staying current	DOT	National level	Other	
Websites								submittal of material by DOTs, and increasing awareness about these sites. If paired with other strategies such as Distribution Lists (#3) or RSS (#5), the benefits of this strategy would increase.
9. Persistent Uniform Resource Locators (PURLs)	Med	Low	Medium	Medium	X	X	X	Establishing PURLs can be technically difficult. Once established, PURLs make maintenance of hyperlinks much easier – resulting in benefits for both materials managers and users.
10. Internal Search Engine Optimization	Med	Low	Low	High	X			Two techniques grouped under this strategy, ensuring that webpages and documents include informative metadata and a HTML title, are not complex and require a relatively low level of effort. Another technique, using an informative website directory structure, can be more difficult to implement. Putting these techniques in place leverages the internal search engine on a website and results in a better user experience.
11. Modern Techniques to Highlight Content Updates	Low	Low	Medium	Medium	X			The techniques described as part of this strategy are not hard to implement or maintain and require little IT support. They can be very effective at drawing users' attention to updates and new material when they visit a site.
12. Centralized Search Site	High	Med	High	High	X	X	X	This strategy requires the development and ownership of a new website. If implemented, this strategy would provide a robust search mechanism to allow users to search within a state's documentation and also across states' websites.

BACKGROUND

As the National Environmental Policy Act (NEPA) applies to federal actions in all 50 states, most state Departments of Transportation (DOTs) have partnered with the Federal Highway Administration (FHWA) to develop and implement policies and procedures, including tools and templates, for the implementation of NEPA as it best suits the individual states. While there are subtle differences in the way NEPA is implemented across the states, time and resources can be saved if state DOTs had a more efficient and effective way to share the tools and guidance that they have developed with one another. Individual DOTs would not need to “reinvent the wheel.”

Another common problem shared by individual DOTs is how to effectively and efficiently maintain their guidance and manuals to keep pace with the rapidly changing requirements related to NEPA compliance and associated guidance and regulations. For example, for those DOTs that maintain their manuals online keeping links to websites current is a constant challenge. As federal and other entities update their websites and particularly change their web addresses, state DOTs that link to those sites must update their own websites. For those DOTs that maintain paper manuals, there are lessons to share about the most effective means to make and distribute revisions.

The purpose of National Cooperative Highway Research Program (NCHRP) project 25-25 Task (77) is to provide the transportation community with a better understanding of the range of NEPA guidance materials developed at the state levels, current practices for maintaining and sharing these materials, associated challenges, and recommended strategies. The methods used and findings from the project are summarized in this report.

RESEARCH APPROACH

This project was conducted in five tasks:

- Task 1 – Conduct a review and inventory NEPA guidance materials.
- Task 2 – Gather information that identifies state DOT practices of sharing and maintaining NEPA guidance materials, including successes and challenges.
- Task 3 – Analyze and report results.
- Task 4 – Develop and suggest strategies and best practices for sharing and maintaining NEPA guidance materials.
- Task 5 – Prepare final report.

The methods used to carry out the substantive steps within each task are summarized in this section.

REVIEW AND INVENTORY OF NEPA GUIDANCE MATERIALS

The purpose of Task 1 was to inventory current practices used to maintain and share NEPA guidance materials, along with the types of guidance available. The research team used multiple sources for building the inventory of NEPA-related manuals, guidance, and other literature maintained by state DOTs:

- The team searched the Federal Highway Administration's (FHWA's) Environmental Toolkit State Practices Database¹ using the "Environmental (NEPA) Documentation" topic area.
- The team captured and updated information compiled for a related inventory project completed in 2004 for the Utah Department of Transportation. For this effort, information about existing environmental assessment (EA) guidelines and related materials from state DOTs and federal agencies was gathered. Available data included links to these materials contacts in each state. The team checked the links or URLs from the Utah project to make sure they were current. In many cases the URL's required updating, which was noted by research staff in the inventory.
- The team reviewed each state DOT website. Research staff primarily identified sites using Google. Once the DOT website was found, research staff used the search tools within the site (if available) to find NEPA and related guidance materials.

For states that maintain extensive NEPA-related guidance online, the team created one entry for the overall site, noting the discipline-specific topic areas for which guidance is provided and the overall functionality of the site. If there was an overall environmental guidebook or similar publication, it was captured as an additional entry. For most states, information for each individual NEPA-related guidance material was captured.

In the inventory, basic information recorded for each entry includes:

- issuing agency or agencies
- material type (e.g., report, memorandum)
- material format (PDF, interactive web page)
- topic description (i.e., a summary description of the material)
- metadata (if available)
- URL(s) where material was accessed
- web administrator name/contact
- author name and contact
- history of updates
- planned frequency of updates

Multiple fields in the inventory capture the topic(s) and subtopic(s) covered by each entry. The team used the following list, modeled after the American Association of State Highway and Transportation Officials (AASHTO) Center for Environmental Excellence and FHWA's Environmental Toolkit site, to organize findings into four main topics. Examples of the subtopics are shown in parentheses:

- NEPA Process and Documentation (e.g., Categorical Exclusion, Environmental Assessment)

¹ <http://environment.fhwa.dot.gov/strmlng/es3stateprac.asp>

- Key Components of the NEPA Process (e.g., Purpose and Need; Alternatives Analysis; Direct, Indirect and Cumulative Impacts)
- Topic Areas (e.g., SAFETEA-LU, Natural Environment, Human Environment)
- Initiatives (e.g., NEPA and Project Development/Streamlining, NEPA and Context Sensitive Solutions)

After completing the internet research, the team conducted a gap analysis to identify any state DOTs for which NEPA-related guidance or materials were not found. Fourteen state DOTs were identified for follow-up and were contacted for information regarding their current practices for maintaining and sharing materials. Contact information for each state was obtained from the previous work for Utah DOT as well as information maintained by AASHTO. The inventory was then updated to include the information gathered during the follow-up. The complete inventory, which captures information for 42 states, is included in Appendix A.

IDENTIFY STATE DEPARTMENT PRACTICES OF MAINTAINING AND SHARING NEPA GUIDANCE

Task 2 involved interviews with a selected group of DOTs and federal agencies with the purposes of:

- 1) validating the information captured in the inventory;
- 2) identifying successful practices for sharing and maintaining NEPA guidance materials;
- 3) identifying challenges, barriers or inefficiencies in sharing and maintaining NEPA guidance materials; and
- 4) identifying features or functions that are desirable in any method for sharing and maintaining NEPA guidance materials.

Based on the information gathered for the inventory under Task 1, the team selected and the panel approved a subgroup of 14 state DOTs and three federal agencies for interviews under Task 2. Ten of the 14 states were selected for interviews with the remaining four identified as alternates. The state DOTs selected represented all major regions across the country and maintained a range of web-based materials, an intranet site or a combination of both, to share materials. Also included were states in the process of updating their materials or that have a unique aspect to their NEPA implementation processes. The federal agencies selected maintain extensive NEPA guidance materials online.

The team contacted two individuals at each state DOT to identify the primary person responsible for managing the NEPA guidance materials as well as NEPA practitioners. The initial contact with all agencies was made by email explaining the purpose of the project and requesting a telephone interview. The set of interview questions were designed to take approximately 20 minutes and were provided in advance of the interview, if requested. In all, the team conducted 16 telephone interviews. The federal and state agencies interviewed under this task are listed in Table 1. For the state DOTs, in most cases the NEPA guidance materials managers were also involved or responsible for reviewing or preparing NEPA documents, while in other cases separate interviews were conducted with NEPA practitioners. The federal interviewees were primarily responsible for disseminating, developing, and maintaining NEPA guidance materials for their agencies. Verbal responses captured by the interviewers are provided in Appendix B.

Table 1. Federal and State Agencies Interviewed for Task 2 and Role of the Interviewee

Agency	Role of Interviewee(s)	
	Materials Manager	Practitioner
Federal Agencies		
Federal Highway Administration	√	
U.S. Army Environmental Command	√	
U.S. Department of Energy	√	
State Departments of Transportation		
Alaska Department of Transportation & Public Facilities	√	√
California Department of Transportation	√	√
Florida Department of Transportation	√	√
Idaho Department of Transportation	√	√
Maryland State Highway Administration	√	
Michigan Department of Transportation	√	√
North Carolina Department of Transportation	√	√
Tennessee Department of Transportation	√	
Texas Department of Transportation	√	√
Washington State Department of Transportation	√	

DEVELOP AND SUGGEST APPROACHES FOR SHARING AND MAINTAINING NEPA GUIDANCE MATERIALS

To identify strategies that specifically address the challenges identified through the interview process, other known challenges, and desired features and functions described by interviewees; the team created a matrix to match challenges, material types and desired features with current successful practices and new strategies. The team analyzed how the challenges and desired features and functions could be addressed by the current set of successful practices identified through the interview process. A brainstorming exercise was conducted to ensure that every challenge was addressed by at least one strategy. Team members participating in this task included experts in: NEPA and transportation, information technology, and library science. Collaboration among these disciplines was important to find strategies that draw from the latest science and technology and that can be applied in practice in this field.

The team identified strategies that could be implemented relatively easily in the short-term and that may be implemented by individual agencies as well as strategies that are more elaborate, requiring a more substantial investment of time and resources but also providing a collective long-term solution. The full matrix of strategies is presented in the next section.

FINDINGS AND APPLICATIONS

RESULTS FROM INTERVIEWS

A summary of the interview findings is presented below with current practices described first, followed by the successful practices and challenges encountered by the agencies in sharing, updating, and maintaining NEPA related guidance as well as recommendations suggested by interviewees. Detailed notes for each interview are provided in Appendix B.

Current Practices

Results of the internet research for 42 states are documented in the inventory. Most of the state DOTs inventoried maintain one or more of the following:

- 1) extensive materials through a designated website,
- 2) a cohesive environmental procedures manual,
- 3) an advanced environmental management system, or
- 4) an intranet site to share materials.

Some states are currently in the process of developing NEPA-related materials they plan to publish on the internet in the future, while others rely on existing guidance produced by federal agencies such as FHWA, Council on Environmental Quality (CEQ), or other organizations like AASHTO. The majority of interviewees published NEPA guidance materials on their website, making it accessible to the public as well as internal and external users. Many also maintain internal sites.

Nearly all states provide at least some of their materials in an electronic format and no longer rely solely on paper manuals. Most interviewees preferred electronic over paper, but provided paper copies upon request or if someone did not have computer access. Electronic versions of guidance materials are often just a PDF of the hard copy, although some PDFs contain hyperlinks to other manuals or other agency websites (e.g. FHWA, Code of Federal Regulations [CFR]) on the internet. Other formats used include Microsoft (MS) Word and HTML.

The primary reasons reported for using electronic systems include the following: (1) difficulty in keeping large cumbersome paper based manuals up to date, (2) accessibility and availability, and (3) consistency.

The two most common ways of classifying NEPA-related materials were by class of environmental documentation (CE, EA, EIS, etc.) and resource topic/subtopics. Many used some metadata information, with author, file size, and date, being the most common.

The majority of interviewees indicated they access other agency and state websites looking for NEPA guidance materials including federal agencies (FHWA, Council on Environmental Quality [CEQ], Federal Transit Administration, U.S. Forest Service, etc.), surrounding states with similar environmental issues, and states with extensive state environmental laws and/or advanced information management systems, such as California and Washington. Other sites were visited to see how challenging situations were being handled by that agency or to see what guidance may be available for a particular resource topic.

Interviewees indicated that materials are typically updated as needed and most agencies update manuals regularly with timeframes ranging from six months to three years. FHWA and U.S. Department of Energy (DOE) publish regular newsletters (monthly and quarterly, respectively) that provide notice of

new or updated materials, regulations, etc. The U.S. Army Environmental Command (USAEC) posts CEQ updates on a website every three months and sends email notifications that updates are available. Some states indicated they also send emails, or post announcements on their websites, providing notice of updates or new materials.

Successes

The primary benefits cited by many of the interviewees of having electronic systems are similar to the reasons given for developing electronic systems in the first place:

- 1) it is easier to update electronic materials and websites,
- 2) the materials are readily and widely accessible, and
- 3) it provides for consistency because everyone (internal and external users, and the public) has the same information which also results in transparency.

Four state DOTs felt the NEPA guidance materials they developed document their practices in an accessible format. One state DOT thought publishing the materials online provided the public with an overview of how they “choose to do business.” Another felt the materials provided for a mutually agreed upon framework for conflict resolution and negotiation with the FHWA division office and/or internal staff.

Seven interviewees stated using web-based systems linked to the internet provides access to a wide range of reference or supplementary materials using hyperlinks within documents to relevant/current information including CFRs, other laws or regulations, court cases, example documents, and other websites. Three noted they no longer cite or summarize regulations they only provide the hyperlink. One issue with internet-based material is that embedded hyperlinks can become out-dated. Three states successfully addressed this issue by providing a comment area on their website where users could notify them of broken links. Other states were notified by email or telephone and some states indicated they schedule regular maintenance checks of each link.

Four states made comments related to the importance of open and easy communication between the users of the NEPA-related guidance materials and the managers. Material users need to make sure they have the most up-to-date material and, in turn, often notify managers when they find material or links that need to be updated.

One state DOT noted that they developed a glossary to promote consistent use of terminology. Using consistent terminology across the agency also contributes to the usefulness of the search function built into their website.

The availability of NEPA-related guidance materials online meant that the materials were more often used by practitioners when compared to paper-based manuals, which are difficult to use and frequently out of date.

One state found that having a website was beneficial because it also provides a means for getting comments on draft guidance prior to finalization. In addition, using XML and HTML formats allows for information to be updated easily in one location, eliminating the need to create content repeatedly.

Another interviewee noted it was a good way to manage agency “knowledge” in a single location. It was also reported that the posting history was valuable for FHWA audits of the *NEPA Delegation Pilot Program*.

Challenges

Overwhelmingly, the biggest challenges are with maintaining the NEPA guidance materials and keeping them up to date. The single biggest challenge encountered by interviewees is keeping the information published online current, including finding the time and resources to make updates or revisions. Persons who are responsible for revising materials, such as managers or technical experts, have other responsibilities as well, making it difficult for them to find the time to make the revisions. Once the content of the materials is updated, getting it posted often requires IT support, which also adds to the time it takes for posting and could cause further delays when priorities between divisions are different. Most everyone said obtaining approval prior to being able to post new or updated materials is also a challenge in terms of the time required. It was also noted that as the electronic system or website grows more extensive, the volume of material requiring maintenance presents difficulties in terms of staffing and time. At times laws change while a project is already underway and updating guidance materials is required “overnight”, which is especially difficult to accomplish. Also challenging is managing redundant data and discrepancies with data or information posted in different locations or documents. If information is updated in one location there is frequently a “domino effect” requiring updates in various locations or documents.

To address a common challenge of “having to do more with less,” one agency maintains a log of updates that are needed, and prioritizes them as determined by the Environmental Management Office Chief and NEPA Delegation Manager.

Keeping users informed of new updates or revisions is also not easy as noted by four interviewees, in particular ensuring practitioners review and use the most current guidance and materials. While experienced practitioners are generally familiar with what guidance is available, there needs to be a consistent/easy way to ensure new users are aware of what is available and how to get to it.

The electronic guidance document is often just a PDF of the hard copy version, which does not make it easier to update because both versions have to be revised. This also results in more cumbersome searching, because each PDF of a section or chapter in a manual had to be opened and searched individually, instead of having the ability to search the entire document.

Five interviewees commented on the time required to keep the hyperlinks updated.

One of the larger states mentioned that it was a challenge to customize guidance for each region in one state because the resources and impacts were so variable from region to region. In addition, the guidance also had to be customized to reflect FHWA’s general guidance.

Fewer challenges were expressed regarding accessing NEPA materials from other agencies, compared to the number of challenges expressed related to maintaining and updating an agency’s own materials. When accessing NEPA guidance materials from other agencies, interviewees expressed some frustration with locating information or documents as a result of search functions that did not work well or the different organizational structure between DOTs. Another noted that acronyms and terms are frequently used differently, sometimes within agencies as well as in different states, increasing issues with using the search function. Information can also be difficult to find on websites that are updated on a regular basis.

Recommendations from Interviewees

Nine interviewees indicated having more staff resources available would be the most helpful in updating and maintaining NEPA-related materials, specifically more time allotted for existing staff to make

changes and/or more money for dedicated staff or consultants to do it. Interviewees didn't come up with solutions for this situation, but did provide suggestions that could help. Two states expressed a desire for training on how to make updates and publish materials on websites that could potentially reduce or eliminate dependence on IT staff and increase the number of individuals available to update materials.

Alternatively, the process of maintaining and updating electronic systems needs to be more efficient and less time consuming. Three state DOTs noted that having a formal process or procedure for updating websites was important and would make it more efficient to share materials online, while others thought the procedures they had in place worked well. Some interviewees noted that often an individual technical expert is relied upon to provide updates as needed. It is helpful if that technical expert can provide updates in a format/software that is familiar, such as MSWord. Several states and federal agencies interviewed have extensive experience maintaining websites and materials online, these agencies could help other states implement successful practices as they continue to develop their existing methods for sharing NEPA-related guidance materials. For example the Texas DOT indicated they use a process where content was updated by the subject-matter experts in MS Word, then converted using structured FrameMaker (Adobe software package) into XML, and finally to HTML. This process is very automated and eliminates updating the same information in multiple places. While it may not be feasible to reduce the resources (staff or time) or approval process necessary to develop new content or update materials, finding methods to make it easier to update information published online would increase efficiency.

There are different opinions about whether it is useful to have both a formal guidance manual (maintained online) and a dynamic website (for example, with materials available by subject area). Some agencies find it difficult to maintain both a manual and a website, while others find that it is useful to have official/approved guidance and a more dynamic, informal and easier to update website. Some recommendations were related to presentation of the material within the guidance manual, such as providing links to relevant CFRs and other material instead of duplicating the text of those citations within the manual.

Getting the word out to users that updates or new materials are available is essential; some methods suggested include maintaining distribution lists or a listserv, and Really Simple Syndication (RSS) feeds. These notifications could be incorporated into scheduled tasks or updates. One procedure currently in use includes notifying districts of updates via email followed by highlighting in yellow updated chapters on the website. The Army Environmental Command distributes email notifications and both FHWA and DOE publish regular newsletters that provide details on new or updated information.

Nine state DOTs indicated the ability to search documents and websites was the most desirable function they wanted. Many noted that existing search functions need improvement and that being able to search by key word, title, and topic was important. In addition, interviewees want the ability to do a dynamic search of an entire document at once to find the different locations where the same topic was discussed. Using metadata more often and more of it, was suggested as a way to get better search results. One interviewee recommended looking into Darwin Information Typing Architecture (DITA): as a way to create a simple classification to build a more structured repository of materials. Four interviewees said hyperlinks are also desirable for ease of navigation to current or relevant information. One state DOT recommended an automatic link checker.

Additional desirable features include an archive system for guidance materials, project information and materials; a central repository for NEPA updates; and a forum for discussion between users in the DOT and/or consultants, similar to FHWA's Re: NEPA Forum, but less technical.

Summary of Interview Results

Ten state DOTs were interviewed to identify state DOT practices of sharing and maintaining NEPA guidance materials, including successes and challenges. In summary, all of the successes interviewees cited were a result of developing electronic systems for maintaining and sharing NEPA guidance materials, including implementing a web-based system. Interviewees also cited several common themes related to the challenges of using, maintaining, and updating the NEPA guidance materials and websites, as well as some challenges with sharing and accessing materials from other state DOTs and federal agencies websites. Table 2 summarizes the success and challenge themes that were captured from state DOTs during Task 2. The themes are listed in the table, ordered by the number of agencies noting the success or challenge, as indicated by the number included in parenthesis.

Table 2. Summary of Key Success and Challenge Themes

Successes for Maintaining and Sharing NEPA Guidance Materials (Number of State DOTs)
<ul style="list-style-type: none"> • Online guidance is readily accessible (7) • Can hyperlink to other policies, regulations, and guidance materials (7) • Website provides an overview of agency practices (4) • Online guidance is used more often and is easier to use (4) • Online guidance can be updated in one location (4) • Website provides a means of receiving notification of broken links or out of date material (3) • Agreed upon materials provide forum for conflict resolution (1) • Website provides means of getting comments on draft guidance materials (1) • Use of a glossary of terms promotes usefulness of search function (1) • It is good place to capture agency “knowledge” all in a single location (1)
Challenges of Maintaining and Sharing NEPA Guidance Materials (Number of State DOTs)
<ul style="list-style-type: none"> • Finding resources/personnel with the time to make the updates/revisions (9) • Keeping guidance up to date, including websites (7) • Additional time needed to coordinate with IT support (5) • The amount of time required to keep hyperlinks up to date (5) • Lack of consistent/easy way to keep practitioners informed of updates and revisions (4) • Electronic system/website is ever-expanding - - always more to maintain and keep updated (3) • Each PDF document has to be searched and updated separately if not part of a “live” site (1) • Maintaining separate or tailored guidance for different regions (1)
Challenges Associated with Accessing other Agencies’ Guidance Materials (Number of State DOTs)
<ul style="list-style-type: none"> • Different organizational structures and updating websites frequently can make materials difficult to find (3) • Search functions don’t always work as expected (1) • Different uses of terms and acronyms can make it difficult to find what you are looking for (1)

RECOMMENDED STRATEGIES FOR SHARING, UPDATING, AND MAINTAINING NEPA GUIDANCE MATERIALS

Recommended strategies for sharing, updating, and maintaining NEPA guidance materials are described in this section. A matrix cross-referencing how each strategy addresses the challenges identified through the interview process, and other known challenges, is provided in Table 3. The level of effort to implement and maintain each strategy, along with the expected benefits, and recommendations for a primary implementing agency or organization are summarized in Table 4. This information is meant to be a general and high-level summary – both the level of effort and resulting benefit would vary according to the specific circumstances of each agency and strategy. Following the tables, detailed descriptions for each strategy are provided. The descriptions include an explanation of how the strategy works, a supporting example, a qualitative assessment of how readily it might be implemented, and its advantages and disadvantages.

Table 3. Matrix of Challenges and Strategies for Updating, Sharing, and Maintaining NEPA Guidance Material

STRATEGIES	CHALLENGES ADDRESSED																		MATERIAL TYPES SUPPORTED			
	Challenges Identified in Interviews															Other Challenges						
	Keeping guidance up to date, including websites	Lack of resources	Informing users of updates	Educating new users	Coordinating with IT support	Unfamiliar Technology	Searching PDFs	Updating PDFs	Updating hyperlinks	Updating guidance kept in multiple locations	Making quick updates	Maintaining tailored guidance	Search functions	Finding materials online	Different terms	Siloed searches across agencies	Lack of knowledge about existing tools/sites	Lack of connectivity between existing tools/sites	Internet Site	Intranet Site	PDF	Word Processing Document
1. Glossary				X			X						X		X				X	X	X	X
2. Technical training	X	X		X	X	X					X								X	X		
3. Distribution list			X	X															X	X	X	X
4. Formal Process & Tools	X	X	X		X			X	X	X	X	X							X	X	X	X
5. Really Simple Syndication (RSS)			X											X					X			
6. RSS Aggregator			X	X									X	X			X		X			
7. Semantic Coding			X	X			X						X	X	X	X	X	X	X			
8. Expanded use of Existing Reference Websites			X	X									X	X		X	X	X	X			
9. Persistent URLs	X								X				X						X			
10.Internal Search Engine Optimization													X	X					X			
11.Modern Techniques to Highlight Content Updates	X		X	X	X									X					X	X		
12.Centralized Search Site			X	X									X	X		X	X	X	X			

Table 4. Matrix of Level of Effort to Implement and Maintain Strategies for Updating, Sharing, and Maintaining NEPA Guidance Material and resulting Benefits

STRATEGIES	Level of Effort		Expected Benefit		Implementing Agency			Explanation
	To implement strategy	To maintain strategy	Ability to increase the efficiency of maintaining and sharing material	Ability to increase the efficiency of finding material and staying current	DOT	National	Other	
1. Glossary	Low	Low	Low	Medium	X			Developing and maintaining a glossary requires no IT support. The primary purpose is to help users understand agency-specific terminology to increase their ability to find and understand material. Terminology is often agency-specific and best defined at the DOT level. The strategy could be used in combination with other strategies, such as Centralized Search Site (#12).
2. Technical training	Med	Low	High	None	X			Technical training for subject matter material managers focused on simple, ongoing, or repetitive tasks typically performed by an IT expert could increase the efficiency of updating and maintaining materials. It would require some level of effort to develop and initiate the training, but then could become routine. This strategy is best implemented by individual DOTs for their specific processes and software.
3. Distribution list	Low	Low	High	High	X	X	X	Creating an email distribution list of users would require a relatively low level of effort. It would help material managers inform users of updates and help users stay current. Individual DOTs would primarily implement this strategy; however, it could complement other strategies including an RSS Aggregator (Strategy #6) or Expanded use of Existing Reference Websites (Strategy #8).
4. Formal Process & Tools	Med	Low	High	None	X			This strategy encompasses a range of processes and tools directed at making it easier for materials managers to keep content current. The

STRATEGIES	Level of Effort		Expected Benefit		Implementing Agency			Explanation
	To implement strategy	To maintain strategy	Ability to increase the efficiency of maintaining and sharing material	Ability to increase the efficiency of finding material and staying current	DOT	National	Other	
								levels of effort required to implement and maintain these processes and tools ranges – but are generally low to medium. Once in place, this strategy can increase the efficiency of maintaining and updating content.
5. Really Simple Syndication (RSS)	Med	Low	Medium	High	X	X	X	Implementing RSS requires some IT support, but is not a highly technical or expensive strategy. Once in place, it is easily maintained. RSS is an easy way for material managers to keep their users up to date. RSS would be implemented on individual DOT pages. It could also be used to complement the Expanded use of Existing Reference Websites (Strategy #8).
6. RSS Aggregator	High	High	High	High	X	X	X	Since this strategy requires the development of a website, the implementation and maintenance efforts are high. While the site would likely be owned and operated by a national organization, the aggregator would require participating DOTs to establish RSS feeds. It would provide an excellent way to share and stay current on updates and new materials across the country.
7. Semantic Coding	High	Med	Low	High	X			Semantic coding requires adding microformats to existing and new web material. This is a relatively new strategy and, initially, would require a high level of IT effort. The outcome would be powerful search results using common engines like Google and Bing, creating a high added value for material users.
8. Expanded use of Existing Reference	Low	Low	Medium	Medium	X	X	X	This strategy does not require the development of a new website, rather leverages existing sites. Implementation mainly involves the ongoing

STRATEGIES	Level of Effort		Expected Benefit		Implementing Agency			Explanation
	To implement strategy	To maintain strategy	Ability to increase the efficiency of maintaining and sharing material	Ability to increase the efficiency of finding material and staying current	DOT	National	Other	
Websites								submittal of material by DOTs, and increasing awareness about these sites. If paired with other strategies such as Distribution Lists (#3) or RSS (#5), the benefits of this strategy would increase.
9. Persistent Uniform Resource Locators (PURLs)	Med	Low	Medium	Medium	X			Establishing PURLs can be technically difficult. Once established, PURLs make maintenance of hyperlinks much easier – resulting in benefits for both materials managers and users.
10. Internal Search Engine Optimization	Med	Low	Low	High	X			Two techniques grouped under this strategy, ensuring that webpages and documents include informative metadata and a HTML title, are not complex and require a relatively low level of effort. Another technique, using an informative website directory structure, can be more difficult to implement. Putting these techniques in place leverages the internal search engine on a website and results in a better user experience.
11. Modern Techniques to Highlight Content Updates	Low	Low	Medium	Medium	X			The techniques described as part of this strategy are not hard to implement or maintain and require little IT support. They can be very effective at drawing users' attention to updates and new material when they visit a site.
12. Centralized Search Site	High	Med	High	High	X	X	X	This strategy requires the development and ownership of a new website. If implemented, this strategy would provide a robust search mechanism to allow users to search within a state's documentation and also across states' websites.

The research team identified several simple strategies through the interview process that may be useful, but do not require a detailed description:

Strategy #1 - Glossary

A simple approach to address several challenges associated with searching for information, both within an agency and across agencies, is to use a glossary or similar listing of terms with definitions. Glossaries can be incorporated in both web-based and paper-based materials. They require a minimum level of effort to develop and maintain, yet can provide a high return. To aid searching, terms in a glossary could be listed with common synonyms used by other agencies (ex., indirect effects, indirect impacts, secondary effects...). If used with web-based content, hyperlinks within content to the relevant definition in the glossary can be provided. The specific challenges addressed by this strategy are: educating new users, searching PDFs, search functions, and different terms used by different agencies.

Strategy #2 - Technical Training

Several challenges identified through the interviews were related to difficulties associated with subject matter experts needing to rely on IT experts to make changes or updates to materials. To address this challenge, agencies may consider providing technical training to subject matter experts for simple, repetitive, or ongoing tasks that are commonly performed by the IT team.

Several of the strategies listed below focus on IT tasks, but include work that could be accomplished by subject matter experts, not IT staff, given the right training and right existing tools. Modern web content management systems (CMS) provide easy ways for subject matter experts to update add new content, edit existing content, updated RSS feeds, and edit metadata. This could be accomplished by:

- Requesting access to their existing CMS.
- Utilizing existing state training materials and possible training sessions on their existing CMS.
- Utilizing free, online training materials for specific topics like RSS and metadata.
- Joining Twitter and using it as a free, informative learning tool. An easy way to learn about trending topics and leading ideas on a subject is to join Twitter and follow industry leaders in that field and create saved searches on specific topics. For example, following an interesting IT person, who happens to be a transportation librarian, could lead you to learn about the Special Libraries Association. That in turn, could lead to you learn about their 2012 conference in Chicago. Finally, following the #slachicago search term would allow you to see real-time tweets from attendees and get a sense of the popular sessions and trending ideas (see Figure 1).

The specific challenges addressed by this strategy are: keeping guidance up to date, lack of resources, educating new users, coordinating with IT support, unfamiliar technology, and making quick updates.

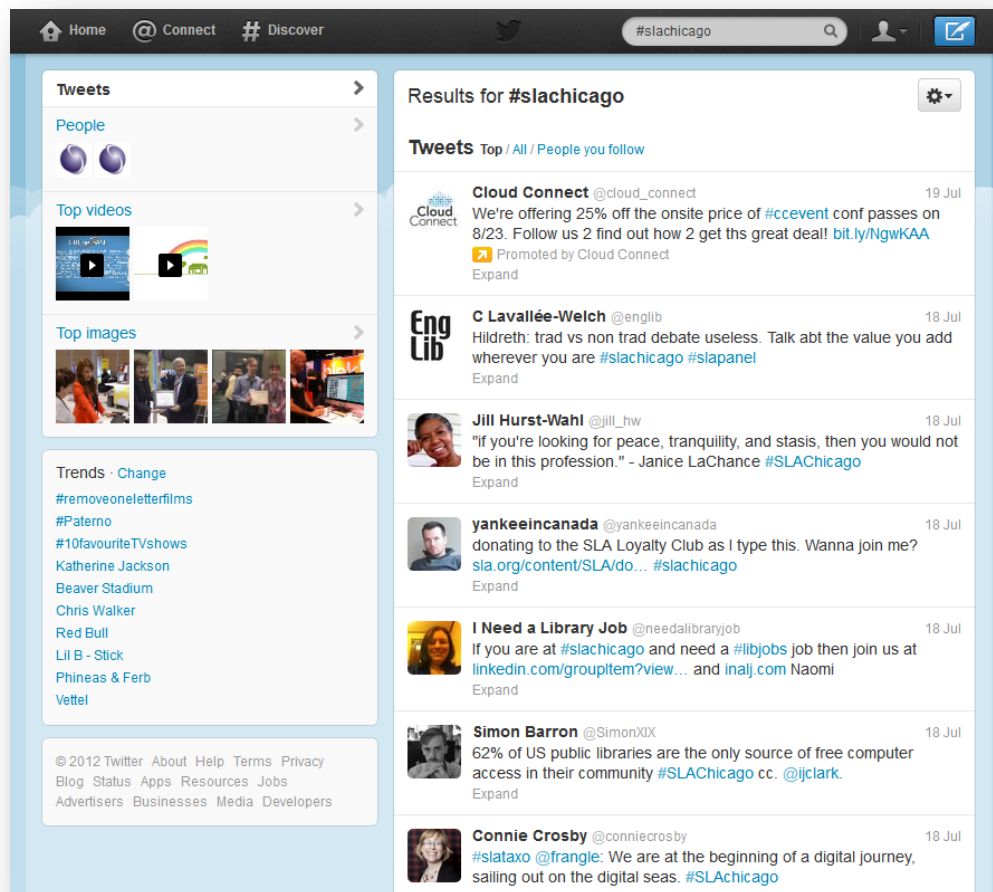


Figure 1. Real-time tweets from SLAChicago 2012 attendees

Strategy #3 - Distribution List of Users

In the interview process, four states made comments related to the importance of open and easy communication between the users of the NEPA-related guidance materials and the material managers. One fairly simple method for informing users of updates to materials is to maintain an email distribution list of users. The distribution list can be used in a variety of ways. An agency could choose to send broadcast emails each time an update is made or send regularly scheduled messages summarizing updates. If an agency maintains their material on the Internet, the message could include a link to the updated material. If paper copies are maintained, they could be sent as an attachment. The specific challenges addressed by this strategy are: informing users of updates and educating new users.

The detailed description of each of the remaining recommended strategies includes an explanation of how it works supported by an example, a qualitative assessment of how readily it might be implemented, and its advantages and disadvantages.

Strategy #4 – Formal Process & Tools for Maintaining and Updating Web-Based NEPA Guidance Materials

Description

Keeping content current was a commonly mentioned challenge by interviewees. This strategy discusses the key points of maintaining content and describes a recommendation for developing and managing a formal process for maintaining and updating NEPA guidance materials. It also offers various tools, software, and best practices helpful to managing various parts of the process.

Example

Some agencies have already implemented many formal processes and tools for maintaining and updating web-based NEPA guidance materials. The California Department of Transportation's (Caltrans) Standard Environmental Reference (SER) web site is one example. Many of the recommendations related to this strategy stem from the lessons Caltrans has learned in the process of developing and maintaining their SER site.

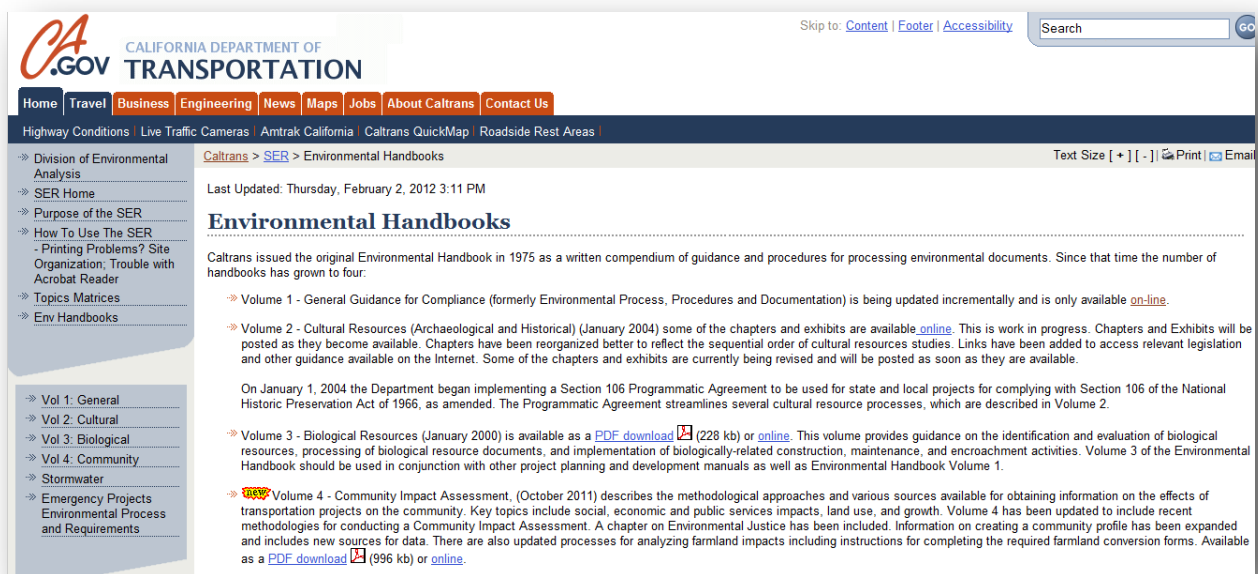


Figure 2. Caltrans Standard Environmental Reference site (<http://www.dot.ca.gov/ser/envhand.htm>)

Implementation and Maintenance Requirements

Software

There are many ways to maintain content on a web site. Some organizations use a basic HTML web page editing software to create and edit their content. Files are typically stored in a shared directory and then designated staff move them to the active/current file location that populates the web site. Some examples are *Adobe Dreamweaver*, *FirstPage*, and *Coffee Cup*. Alternatively, organizations may use more sophisticated content management system software (CMS). This type of software allows for varying permission for multiple content providers, reduces duplication by tracking uploaded documents, and

typically has hyperlink maintenance tools. The features vary greatly across CMS software packages; integration into an enterprise-wide document management system, hosting services by the software company versus being installed on the organization's server, and more. Some examples are *Agility CMS*, *Cascade Server*, and *Joomla!*.

For its many benefits, CMS software is the preferred choice for managing web content. The cost varies as well and can be rather expensive. However, *Joomla!* is an example of an open-source version that is available for download at no cost. A commonly mentioned challenge by interviewees was the need for IT support in order to upload content; a CMS solution allows IT to control access to the critical components needed to keep the web site running while granting permission to non-IT staff to update content with minimal training.

Formal Updating Process

Regardless of the software being used, it is recommended that organizations establish a formal process for maintaining and updating materials that will be effective and efficient. There are four main parts of the process to develop:

- the alerting process for update requests,
- the procedures for routine updates,
- the content review process, and
- the process for uploading changes to the web site.

The Alerting Process

Incorporate Methods for Receiving Feedback from Staff and External Users. Notification of needed updates should incorporate both feedback from organization staff as well as external users of the content. A good tool for doing this is to create a shared mailbox that can be accessed by multiple staff members. This email address (or a link to an online form that is sent to the email address) should be posted on the web site as well as the organization's intranet site if applicable, ideally appearing in the footer of every main page and accompanied by a note requesting readers to respond with updates or corrections.

Process for Reviewing and Prioritizing Feedback. Notifications of needed updates from staff and external users should be reviewed, and any that will be implemented should be organized for further action. One interviewee said that they maintain a log of pending updates, and assign a level of importance to each that drives the order in which they will be acted upon. Keeping a log of pending updates helps prioritize the workload and aids in making assignments to staff for the various update tasks.

Maintain content on a single site. Another way to streamline the alerting (and updating) process is to maintain information on only one web site. Many organizations have both an intranet with staff-only access and a public web site open to all. Rather than post guidance in both places, organizations should identify what content is truly public in nature and what should be accessed by staff only. If content is public information, it is better to provide links on the intranet site that link out to the public site. This not only simplifies the updating process, it drives staff technical experts to review content available to the public, allowing for more opportunity to catch errors and spot updating needs rather than waiting for the public to alert staff to these issues.

Routine Updates

Updates should be done in batches for the most efficient use of staff time. Many organizations find that scheduling updates works well as it reduces staff fatigue from constant updating efforts. Of course, critical updates (a major change in agency guidance, legal statutes, etc.) may necessitate immediate attention. Having content on a web site requires ongoing maintenance that is a separate issue from updating content. There are a few best practices that help ensure that the site continues to be useful for users.

Hyperlink Check. Checking for and fixing broken links is one task that some interviewees mentioned is a time-consuming aspect of maintaining web-based NEPA guidance materials. Typically frequency of link checking will depend on the number of external links; if all links are internal ones it can be done less frequently. One interviewee said that they perform this check monthly. Checking links on a schedule reduces user frustration and raises the overall opinion of the web site. The time to resolve problems is reduced by checking links frequently as the total number of links to check will be less than if this is done only when major updates to the entire web site are undertaken.

To avoid broken links, when linking to a site outside of the organization, it is often better to post a link to the page where the document is described rather than directly to the full document. Site managers may change the name of the file slightly when reposting which can cause link errors. Many web site software solutions include an integrated link verification function. Alternatively, there are many link verification software solutions available that can be used at little or no cost. All solutions operate similarly; administrators can run reports on all links on a site and report any that cannot be resolved to a resulting page or document. The sophistication of the reports varies, but even the simplest versions provide a list of problem links for staff to investigate. There may be a way to view internal links separate from external links on the report. Some examples of stand-alone link verification software are *Link Checker* and *LinkScan*.

Regular Review of Visitor Traffic Metrics. Most web content software allows for pulling reports of browser traffic to the site and all sub-pages. This data should be reviewed regularly by a team comprised of content providers for the site (as opposed to IT staff). This may alert content specialists to pages that could benefit from an RSS feed, or that should be included in higher level navigation from the home page. It can also be helpful to track use trends of the site. If there is information that the organization feels is very important, but is not being visited often, then navigation changes can be made to drive traffic to the content.

Content Review

Established work flow for reviews. The process for technical review of new or updated content can be the most frustrating one to streamline. Typically there are a number of staff involved; technical experts, editorial staff, and others. A word processing program (*Microsoft Word* or similar) should be used with track changes enabled so that each member of the team can review the changes made by others. A number of interviewees stated that they currently use this model in their updating process. It is best if the review is done using a workflow model, where each team member updates and then notifies the next team member to review. This keeps the changes and comments in a single document for that section/chapter/web page and reduces time to finalize. Once all have provided input, there can be a review of the content to finalize it for posting. Furthermore, depending on the size of the organization and the workload, there should be one to three staff that share the role of update coordinator to keep the updating process on track for completion.

Periodic reviews. As part of the formal process, the content specialists should periodically review the entire site. With multiple content providers there can be cases of inconsistent information or overlap in content. This high-level review can uncover important changes that need to be made to the organization of the web site.

Uploading Content

Use subject specialists and communities of practice. Uploading new content to the web site can be streamlined by utilizing a CMS program and also by assigning subject specialists to specific areas of the web site rather than having a single point of contact for updating. The subject specialists can create a community of practice (CoP) group. They can share troubleshooting tips and updating challenges. In addition, if there is a staffing change, the CoP can provide an excellent way to bring a new member up to speed on the organization's web site updating process. Development of CoP group/groups allows the organization to leverage collective experience as part of their overall knowledge management processes.

File types and text recognition. Web content is typically posted as a mix of HTML web pages and links to PDFs or word processing files. PDFs are preferable to word processing files as they are more stable for downloading, and do not require specialized software to open. If documents are scanned from hardcopy paper documents, then they should be made searchable by utilizing OCR (optical character recognition) software. The best way to do this is to have the OCR text in a layer behind the scanned image of the page, rather than to convert the image of the scan to text. No matter how good the software is, computers make errors in interpreting scanned documents. The human eye can correctly read text that is very low quality while a computer cannot see that the black dot next to a letter is meaningless. This way the readers view the scanned pages as captured, but when performing word searches they are searching the OCR text layer behind the image.

Advantages and Disadvantages

The advantages to having a formal process for maintaining content are many. Readers will value the content as higher quality if the information on the web site is consistently current and accurate. Hyperlink errors frustrate readers and lower their opinion of the value of the site. Responding in a timely manner to update alerts gives readers a sense of collaboration on site content that often results in referrals to other readers. Most importantly, agencies can better meet state and federal initiatives to provide electronic access to information by improving their web site management. In addition, the strategies are applicable to the full range of document types and sites: Internet site, Intranet site, PDF, and word processing document.

Disadvantages are primarily those of cost and allocating staff resources. Purchasing CMS software can be expensive, and it can be difficult to get approval for the purchase if there is an existing web site content solution in use. Even if open source software or low-cost software is used, there will be staff time in training and implementation. With budgets tight across all agencies, asking for additional time from staff to participate in web content updating can be difficult. However, there are federal and state grants available for specific projects that result in improved public access to agency information in electronic format.

Common Challenges Addressed

The common challenges associated with updating, maintaining, and sharing NEPA-related guidance addressed by this strategy are:

- Keeping guidance up to date
- Lack of resources (time and money)
- Informing users of updates
- Coordinating with IT support
- Updating PDFs
- Updating hyperlinks
- Updating guidance kept in multiple locations
- Making quick updates to guidance
- Maintaining tailored guidance

Strategy #5 – Publish Announcements and Changes via RSS

Description

Use of Really Simple Syndication (RSS) feeds can address the challenge of keeping users of NEPA guidance materials updated when changes are made. RSS has become a web standard, giving website managers a consistent method for announcing changes to content and website visitors an easy way to learn of important, recent changes without having to constantly re-visit a website and search for updates.

This is how it works:


1. After updating a web page, the author documents the page title, URL, date, and a brief description of the changes and sends them to the web master.
2. The web master updates the RSS file with the information on the new changes. The web master will also ensure that the page has links and possibly the standard RSS logo  to advertise the feed. The webmaster may also add code to the web page to ensure that the web browser can detect the feed. Figure 3 shows how the menu bar in Internet Explorer changes when a page with an RSS feed is visited, note that the RSS logo turns from grey to orange when there is an RSS feed.



Figure 3. Internet Explorer Menu Bar Changes with RSS

If a sophisticated web content management system is used to build the website, the RSS feed is usually generated automatically.

3. The website visitors can subscribe to the feed through several mechanisms:
 - Add the feed to their Favorites as a live bookmark, as shown in the example in Figure 4.
 - Subscribe to the feed through a 3rd party reader like Google Reader.
 - Subscribe to the feed through a mobile phone application.

Because it has become a web standard, RSS feeds also allow other websites and automated tools (like [Google Reader](#)) to process and understand changes to a website. It could allow enterprising application developers, a centralized clearinghouse, or aggregation websites to consolidate the feeds from multiple State DOT websites and provide a service of reporting consolidated updates to NEPA and related guidance.

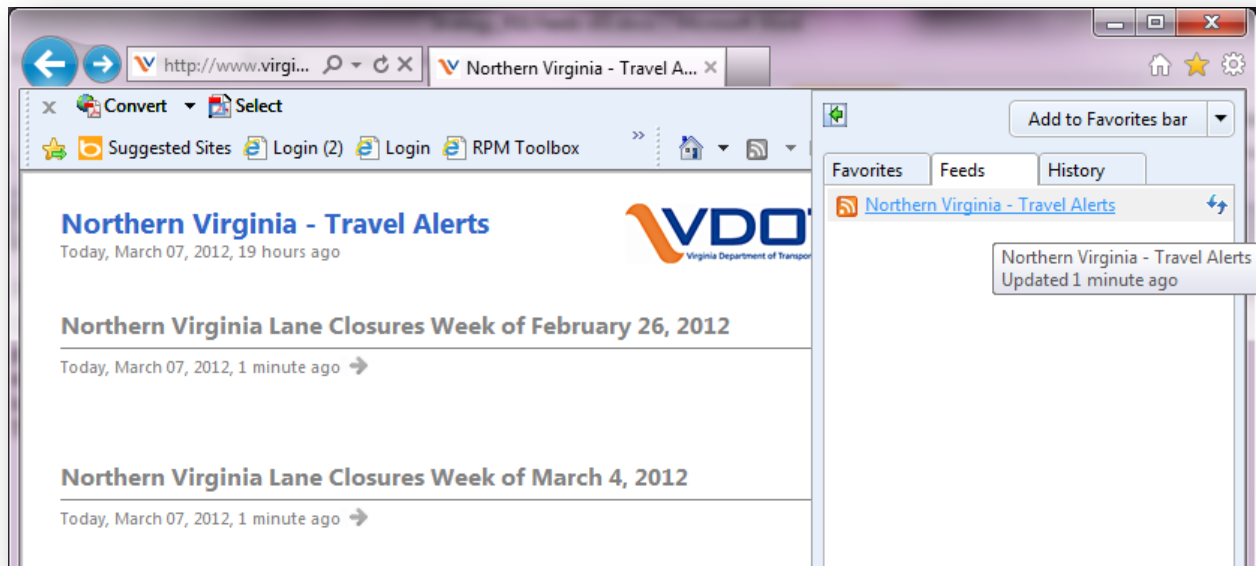


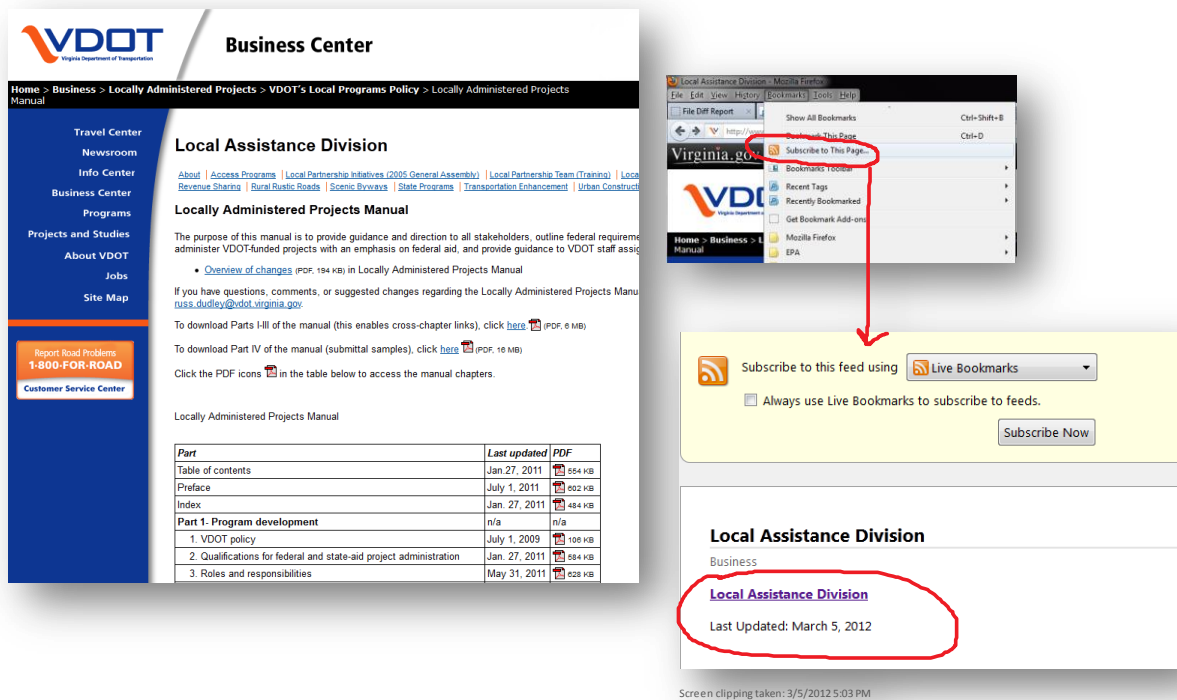
Figure 4. RSS Feed visible through Favorites bookmark²

Example

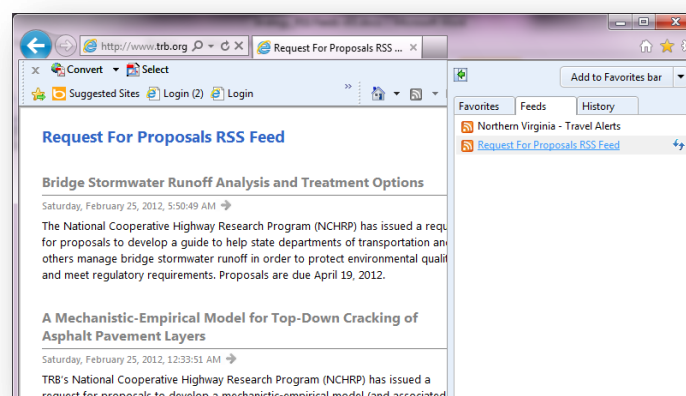
No examples of using RSS feeds to inform practitioners of updates to NEPA guidance materials were identified through the research. However, there are several examples of how RSS feeds are being used in other ways by transportation agencies.

The Virginia Department of Transportation (VDOT) has an online manual for locally administered projects (see Figure 5). The purpose of this manual is to provide guidance and direction to all stakeholders, outline federal requirements for those localities choosing to administer VDOT-funded projects with an emphasis on federal aid, and provide guidance to VDOT staff assigned an oversight role for locally administered projects. This page has an available RSS feed that could be used to publish information on changes to the manual. However, the current feed just has a default link back to the page itself.

² http://www.virginiadot.org/travel/travel_alerts/northern_virginia/default.asp

Figure 5. VDOT's RSS Feed For the Local Assistance Division³

Another example of an RSS feed is TRB's Request for Proposals (RFP) feed (see Figure 6). Many potential bidders subscribe to the feed to be notified immediately when RFPs are released without have to constantly visit the TRB website.

Figure 6 - TRB's Request for Proposal Feed⁴

³ <http://www.virginiadot.org/business/local-assistance.asp>

Implementation and Maintenance Requirements

Developing RSS feeds does not involve special software or license fees. Implementation of an RSS feed can be as simple as the manual creation of a file and its placement in a certain location on the website. States with sophisticated websites created through content management systems may already have existing functionality to document and publish changes via an RSS feed. Creating the RSS feed and updating the feed will probably require a low-level of IT support.

Advantages and Disadvantages

This strategy has several advantages:

- It is relatively cheap to implement.
- It has the potential to easily communicate to a large audience.
- It communicates information updates in standard format that can be utilized in other applications.
- Its effectiveness can be measured through usage analytics like how many people are subscribing to the feed, when they access it, where they accessed it, and which items are the most popular.

There are a few disadvantages:

- State websites without existing RSS feeds will need IT support to initially implement them.
- Given the small use of RSS feeds to communicate changes in environmental guidance today, there may be some organizational barriers to implement RSS feeds for more than just press releases and roadwork announcements.

Common Challenges Addressed

The common challenges associated with updating, maintaining, and sharing NEPA-related guidance addressed by this strategy are:

- Informing users of updates
- Difficulty finding materials online

Strategy #6 – RSS Aggregator

Description

The Really Simple Syndication (RSS) Feeds strategy describes how websites, like those documenting state DOT environmental guidance, can publish updates in a standard format. The RSS feeds can then be read by other websites or applications. If state DOTs agree to develop RSS feeds for their environmental guidance, an aggregator website could be developed to consolidate the feeds from each state DOT and provide a consistent, easy-to-use website to see the update announcements. The consolidated website could:

- Read the RSS feeds each day looking for updates
- Store the update descriptions in a database
- Provide a search mechanism to search through updates

⁴ <http://www.trb.org/Main/RSSfeeds.aspx>

- Allow registered users to sign up for email notifications for specific feeds

Example

A good example of an aggregator site is [Google News](#) (see Figure 7). Google News scans the RSS feeds from all major news outlets (Ex: ABC News, CNN, Reuters) and consolidates the articles across the sources and groups them into news categories (Ex: World, US, Business, Sports). Google does not author any of this content, but just aggregates them from the RSS feeds of the source organizations and provides links to the articles on the source sites.

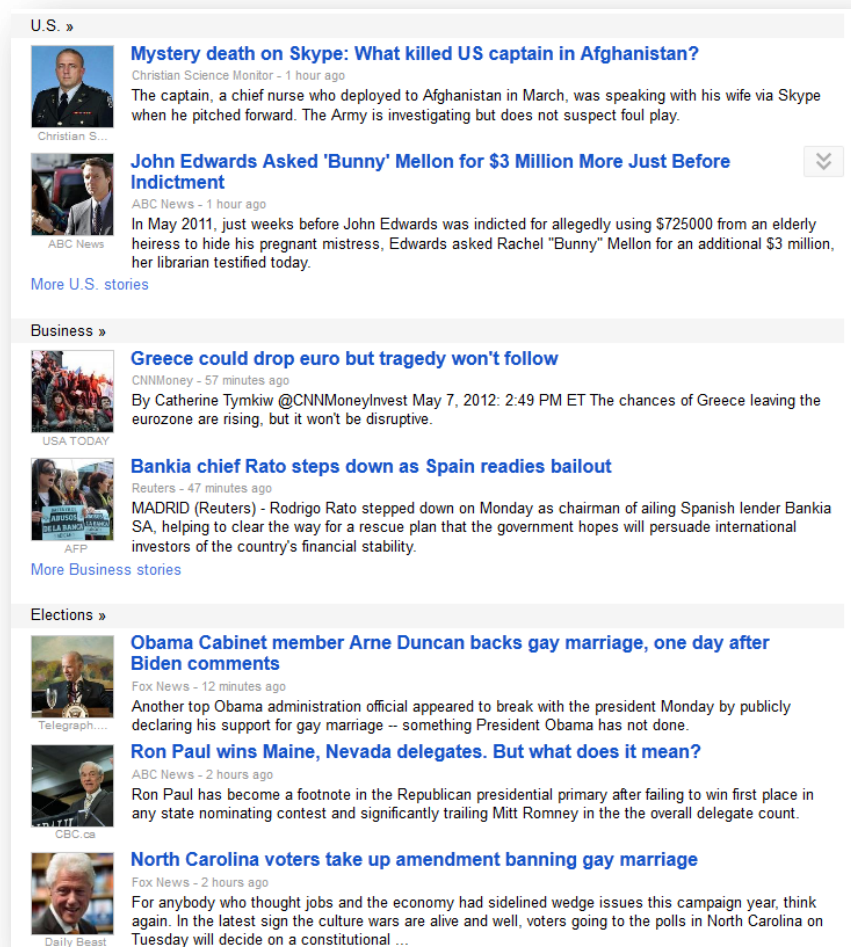


Figure 7. Sample Google News page with articles from various news outlets

Implementation and Maintenance Requirements

Creating an RSS aggregator would involve creating a custom web application. This means a website would need to be designed, developed, tested, and maintained. Funding would need to be secured for the effort and a site owner needs to be defined to manage the site. The RSS Aggregator strategy is a substantial effort but is not as extensive as typical web applications.

In order to be useful, state DOTs would need to participate by publishing changes to their environmental guidance using RSS feeds. This strategy and the effort required is explained in detail under “RSS Feeds”.

Advantages and Disadvantages

This strategy has several advantages:

- An RSS aggregator site would consolidate environment guidance updates from all participating states in one location. For people working in multi-state regions, interested in what other states are doing, or conducting applied research this could be a valuable resource.
- A well-designed, full-text search could provide valuable functionality to the website visitors.

There is one major disadvantage:

- This strategy requires development of a web application, which could be costly. It also would require a website owner to be named/nominated that can maintain the site on behalf of the participating states.

Common Challenges Addressed

The common challenges associated with updating, maintaining, and sharing NEPA-related guidance addressed by this strategy are:

- Informing users of updates
- Educating new users
- Search functions
- Difficulty finding materials online
- Lack of knowledge about existing tools/sites

Strategy #7 – Semantic Coding of Web Pages

Description

Semantic coding of web pages involves adding very detailed, low-level metadata down to the paragraph, bullet, sentence, or word level. Most of us are familiar with the concept of metadata for web pages and documents (Ex: title, author, description, keywords, source...). However, this metadata just describes the document itself, and does not describe specific information within the document. Semantic coding would apply metadata to information within the webpage. Semantic coding is often referred to as microformats because the coding describes small portions of content. Semantic coding has also been referred to as “Web 3.0” (“Web 1.0” was the original use of the web before 2000 and “Web 2.0” was the explosion of social networking after 2000).

Semantic coding offers the promise of web pages and data dispersed across the web that is so well-described by microformats, that search engines will digest and understand complex, scientific data and return valid interpretations and aggregation of the data. Many scientific communities have developed data standards for the exchange of complex data. For example, the Environmental Protection Agency along with the Environmental Council of States has developed numerous data formats for environmental data, like water samples. These standards have allowed the exchange of data among federal agencies, states, municipalities, and industry through their custom IT systems. However, the semantic vision of the data would involve publishing the data on the web pages that is so well-encoded, any researcher in the

world could find, extract, and consume that sample data in their research and be confident in the quality and accuracy of the data.

Semantically coded environmental guidance from all state DOTs would allow for powerful searches from sites like Google and Bing. It could be used to find information across all state DOTs, a selection of agencies, or within one agency website. For example, it could be used to:

- Show procedural guidelines for considering indirect and cumulative impacts for all states
- Itemize the differences in environmental guidance between Caltrans and Virginia DOT in the ecological topic area
- Identify NEPA/404 merger process detailed guidance within the North Carolina DOT website

The figure below is an example of semantic data that could be added to an environmental guidance web page. The image is of the Caltrans web-based Standard Environmental Reference (SER) Chapter 2. The first (blue) callout describes typical, document-level metadata that could be added to a web page. It should be noted that the actual web page does not include these metadata. The other five (red) callouts describe additional microformats that could be added to further describe the guidance and link it to other SER chapters/sections, research, and regulations.

1. Standard Document Metadata

- Title: SER - Env Handbook Vol 3 - Biological Resources
- Author: CALTRANS
- ...

2. Chapter Metadata

- Number
- Title
- Previous Chapter
- Next Chapter
- Related Chapters
- Topics

3. Chapter Section Metadata

- Number
- Title
- Previous Subsection
- Next Subsection
- Related Subsections
- Topics

4. Survey Protocol Metadata

- Title
- Source
- Species
- Habitats

5. Form Metadata

- Title
- Source
- Due Date
- Required Signatures
- Submit To
- Submit Address

6. Citation Metadata

- Title
- Author
- Publication Date
- Publisher
- Page Count

Chapter 2- Natural Environment Study

Caltrans > SER > Env Handbook > Vol 3 > Chapter 2

Last Updated: Friday, February 3, 2012 11:41 AM

2-1 Introduction

2-2 Background Research

2-3 Issue Identification/Scoping

2-3.1 Level of Detail

2-3.2 Area of Direct and Indirect Effect

2-3.3 Contacts with Agencies and Individuals

2-4.4 WILDLIFE SURVEY TECHNIQUES

Given the variety and number of wildlife species and types of habitats found in California, it is impossible to develop a single set of techniques for surveying each species and type of habitat. As mentioned previously, all wildlife surveys must be conducted during a species active period, such as nesting or migration. In cases when surveys must be conducted at times when a species is less likely to be observed, a thorough investigation of the animal's potential habitat should be made. A careful record keeping should report the presence (e.g., tracks, scat, nests or dens, trails, or any other signs) specific to the animal. The surveys for wildlife must be commensurate with the magnitude of the potential effects to the expected resource. Specialized surveys are usually reserved for those instances where a resource is expected in the BSA. Surveys for many of the species listed as threatened or endangered require a protocol established by DFG or FWS and may require a permit (e.g., California red-legged frog survey).

The DFG [Survey and Monitoring Protocols and Guidelines](#) contains specified survey protocols for plants, amphibians, reptiles, birds, and mammals. The protocols and guidelines available are from various sources and are recommended as tested and reviewed methods for their intended purposes. These purposes include presence or support for a negative finding (e.g., habitat not suitable) for a particular species or its location. In some cases, these protocols and guidelines represent what DFG believes to be the best available method for a particular species. The [Survey Protocols and Other Guidelines](#) for federally listed, threatened, endangered species, and for a list of plants and animals native to the United States that are candidates or proposed for possible action, as well as other guidance concerning wildlife survey techniques.

A [California Native Species Field Survey Form](#) should be completed and sent to CNDDDB when sensitive species are found. The information requested in the survey form includes the location of the species (e.g., county, land ownership), habitat description (e.g., plant communities, dominants, associates, substrates/soils, aspects/slopes), overall site, occurrence quality/viability, etc., animal information (e.g., number of adults, juveniles, life history information (e.g., phenology).

A sampling of references that describe wildlife survey techniques is presented. However, this is not intended to be a comprehensive list. Protocols for conducting wildlife surveys must be chosen carefully to ensure the results are appropriate for the circumstances. Each biologist must select the methods with which they feel most comfortable.

Brookhout, T. A., editor. 1994. Research and management techniques for wildlife and habitats. The University of Maryland System, Bethesda, MD. 740 pp.

Cooper, A. Y., R. J. Boyd, and H. R. Stuart, editors. 1986. Inventory and Monitoring of Wildlife and Plants. U.S. Department of Interior, Bureau of Land Management, Service Center. Denver, CO., 858 pp.

Davis, D. E. 1990. CRC Handbook of Census Methods for Terrestrial Vertebrates. CRC Press. 375 pp.

Figure 8. Examples of possible semantic data for online environmental guidance

Example

Microformats are still in their infancy and have really only been defined for simple sets of data like contact information, calendar events, opinions, and relationships (Ex: friend of, works for, works with, married to ...). Microformats.org has become an authoritative website for detailed specifications for typical semantic formats. Each formal standard has a defined schema: the listing and specifications of each field of data that is part of the standard. For example, the hCard (“business card”) schema details all of the fields of the format, including full name, nickname, organization, photo, URL, address, phone number, and email address.

A recent standard is the [hRecipe](#) microformat to semantically encode food recipes displayed on web pages (see Figure 9). The hRecipe schema describes:

- all of the data elements of a recipe
- the data type for each recipe (text, number, date)
- which data elements are required
- relationships between data elements (a recipe has one or more ingredients, a recipe has one or more nutritional elements)

Schema

The hRecipe schema consists of the following properties:

» **hrecipe**

- » **fn.** required. text. the name of the recipe.
- » **ingredient.** required. 1 or more. text with optional valid (x)HTML markup.
 - » **value** and **type.** optional. [experimental]
- » **yield.** optional. text.
- » **instructions.** optional. text with optional valid (x)HTML markup.
- » **duration.** optional. 1 or more. text.
- » **photo.** optional. 1 or more. using any element containing a URL, such as IMG. [experimental]
- » **summary.** optional. text. [experimental]
- » **author.** optional. 1 or more. [experimental]
- » **published.** optional. [experimental]
- » **nutrition.** optional. 1 or more. [experimental]
 - » **value** and **type.** optional. [experimental]
- » **tag.** optional. 1 or more. [experimental]

Figure 9. hRecipe schema definition

Google recently launched a new website, [Recipe View](#), which searches webpages semantically encoded with the hRecipe microformat (see Figure 10). The site’s first benefit describes the power of semantic

data: “When you search for a recipe or ingredient on Google, you’ll get lots of results, but not all of them will be for recipes. Now you can narrow your search results to show only recipes.”

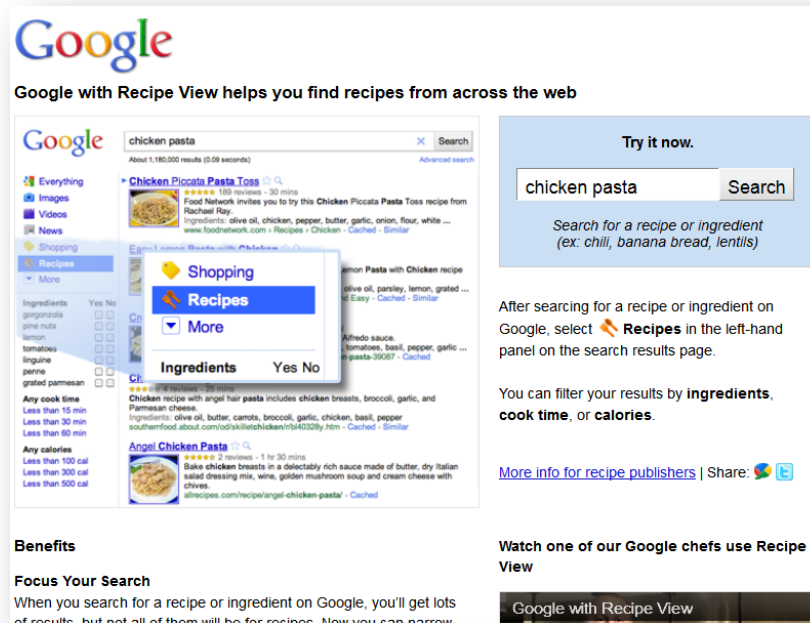


Figure 10. Google Recipe View website

Figure 11 shows a resulting recipe from a “chicken pasta” search. The figure shows both the resulting web page view of the recipe and the semantic coding on the web page. The semantic schema fields are boxed in yellow and their corresponding field values are in green ovals.

31

Implementation and Maintenance Requirements

Ensuring that webpages are semantically coded is a significant effort. Unlike the small effort to add basic document-level metadata to web pages, semantically coding web pages requires:

- the establishment of the microformat standards (if even just for the state DOT and not a federal or international standard)
- detailed review of all web page content and the tagging with microformats (which will include harder to track down information)
- updates to web content management systems (CMSs) to include in-page semantic tagging (this is not standard in most current CMSs)
- manual coding updates by IT staff to websites that are statically developed and not part of a CMS

Maintaining the semantic data across the site over time will be just as burdensome as the initial tagging. The establishment and maintenance of the strategy would require effort from both subject matter experts and IT experts.

Advantages and Disadvantages

This strategy has several advantages:

- Semantically coding the web pages will allow systems and search engines to automatically digest the information and understand the context and relationships with other data on the Internet. This could lead to extremely powerful web searches significantly reducing the research time required by visitors. It could also lead to revelations about the information that were not possible to determine before the web pages were coded.

There are a few disadvantages:

- It is a significant effort to add all of the microformats to the web pages. It also could be a significant effort to update CMSs to allow authors to easily add microformats without updating HTML code.
- Complex microformats, even in industries with established data exchange standards, have not been developed yet. Developing new microformat standards could be a long and frustrating process. The established microformats are just for simple data structures like contact information, calendar events, opinions, relationships, and recipes.
- Semantic coding really only works for web pages and not PDF documents.

Common Challenges Addressed

The common challenges associated with updating, maintaining, and sharing NEPA-related guidance addressed by this strategy are:

- Search functions
- Difficulty finding materials online
- Different use of terms between agencies
- Siloed searches across agencies
- Lack of knowledge about existing tools/sites
- Lack of connectivity between existing tools/sites

Strategy #8 – Expanded Use of Existing Reference Websites

Description

There are several existing reference sites frequently visited by NEPA practitioners in the transportation field. One strategy for promoting the sharing of NEPA related guidance materials is to leverage those existing sites. This strategy relies on the participation of state DOTs to submit material to be posted to existing reference sites and the site managers to post submitted material. Alternatively, these existing reference sites could be considered as a “home” for the RSS Aggregator strategy described separately.

Example

The FHWA’s Environmental Review Toolkit and integrated [State Practices Database](#), shown in Figure 12, is a searchable database of streamlining and stewardship practices used by states to efficiently and effectively fulfill their NEPA obligations. Material in the database is submitted by DOTs, FHWA Divisions, and others and is posted by FHWA with support from Volpe National Transportation Systems Center (Volpe). The database is publicly accessible and searchable by state, key word, and category. Generally, a short description for any posted material is provided along with a link to where further details can be found. The site does not currently use RSS.

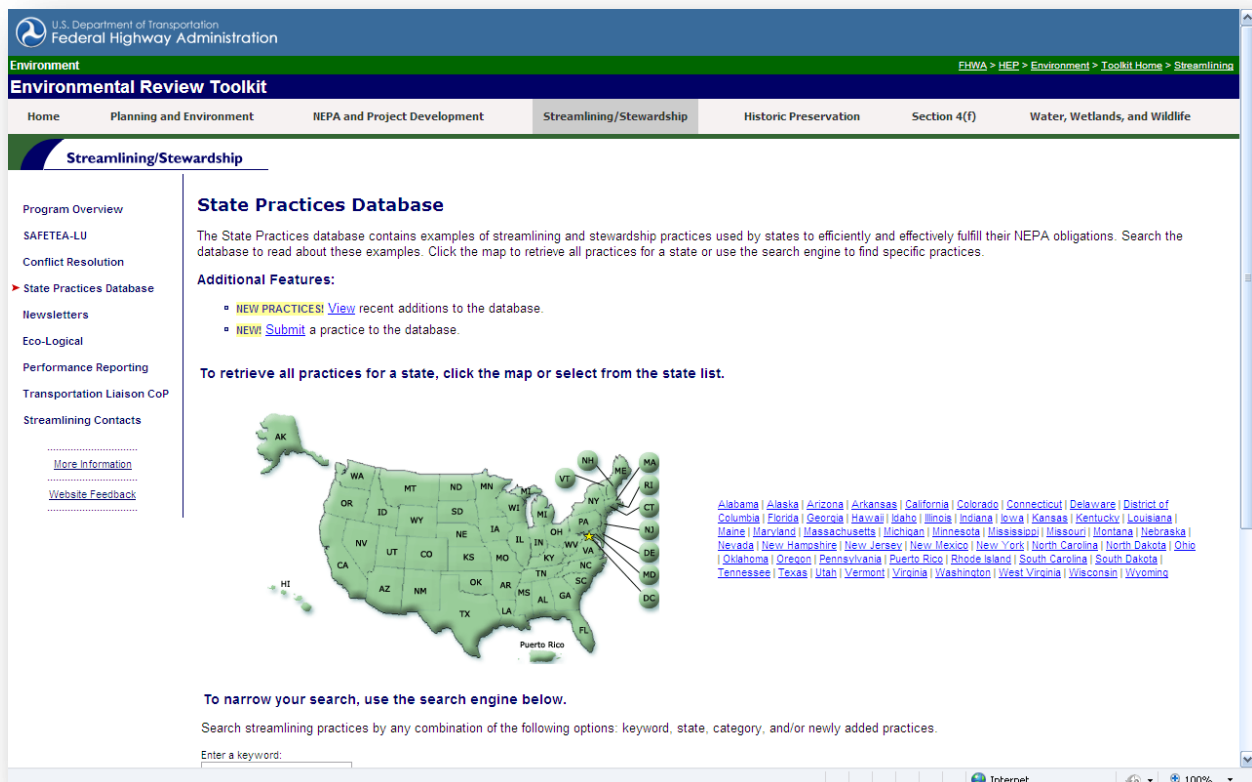


Figure 12. Screenshot of the FHWA State Practices Database

A similar reference site is the Center for Environmental Excellence (CEE), hosted and maintained by the American Association of State Highway and Transportation Officials (AASHTO) and shown in Figure 13. The CEE has a specific section dedicated to the NEPA Process with an area, called “Case Studies” for success stories, best practices and innovative tools. Case studies are submitted by government agencies through a form available on the website. There are only a handful of case studies currently posted. This site does not use RSS.

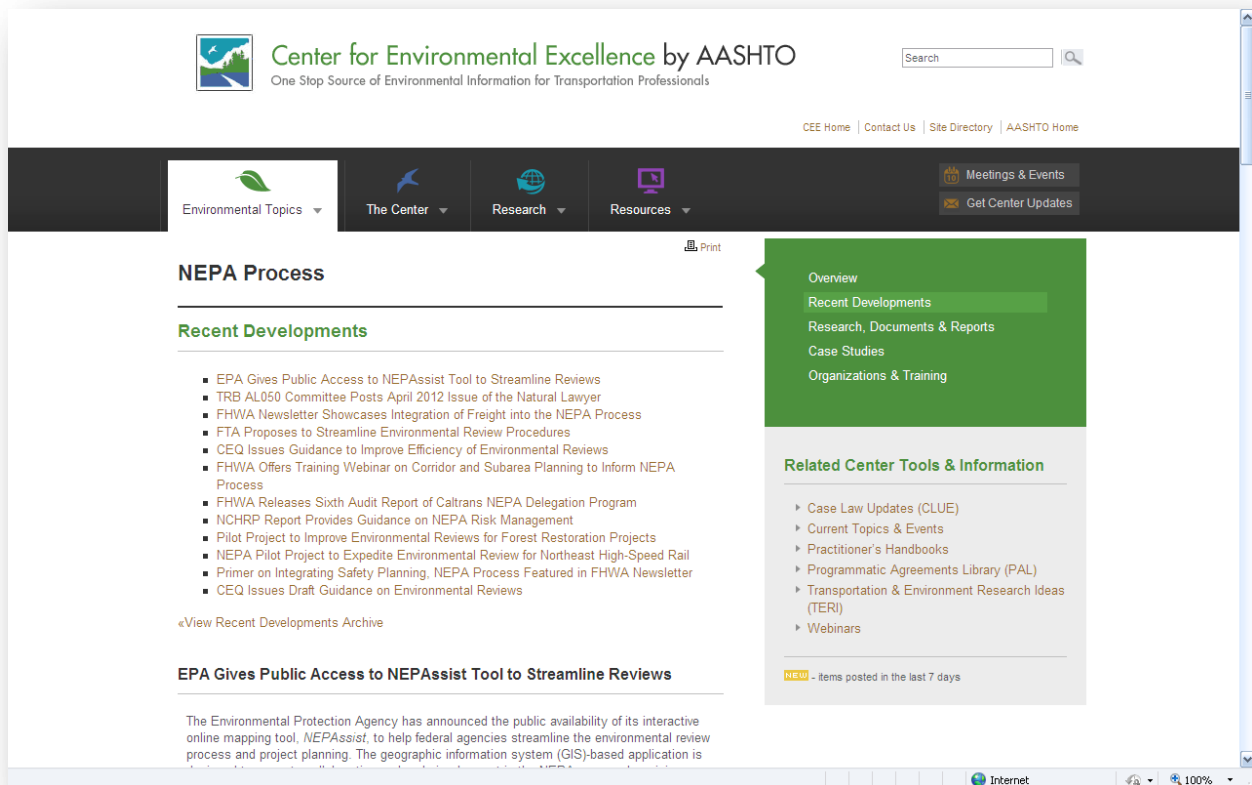


Figure 13. Screenshot of the AASHTO Center for Environmental Excellence
(http://environment.transportation.org/environmental_issues/nepa_process/case_studies.aspx)

Implementation and Maintenance Requirements

In its simplest form, this strategy requires a limited level of effort on the part of state DOTs to submit information to existing resource websites so that it can be accessed and shared more easily across agencies. Both the State Practices Database and the CEE currently have in place the structure and process to acquire and host this information.

There is an additional opportunity to leverage existing resource websites to implement other strategies, such as the RSS Aggregator or Centralized Search Site. This would require additional coordination and effort to determine (1) if there is a desire on the part of the site owners to expand their sites to include this type of service, and (2) the process for accomplishing the expanded service. The levels of effort associated with these individual strategies are described separately.

Advantages and Disadvantages

The benefit of integrating a solution into these existing tools is that those who work in the world of transportation and NEPA are already using them. Promoting the FHWA Environmental Review Toolkit site and encouraging contribution to the State Practices Database from states would help increase sharing of NEPA-related guidance materials and proven practices for doing so. In addition, FHWA's monthly newsletter is available on the toolkit site, which could improve awareness of upcoming updates and new materials.

A challenge is that it requires additional effort on the part of state DOTs to prepare and submit information to be posted. In an interview, representatives from FHWA and Volpe (see Appendix B), indicated that there is desire and capacity on their part to host additional materials in the State Practices database. All state DOTs interviewed were familiar with, and regularly use, the FHWA Environmental Review Toolkit website. However, only about half of the interviewees were aware of the State Practices Database or were only somewhat aware of it, while the other half did know about it and had submitted materials. The majority of interviewees acknowledge they currently access other state DOT or federal websites looking for NEPA-related materials and several interviewees thought it would be helpful to have one location online where links to useful websites and all types of documents were available.

Common Challenges Addressed

The common challenges associated with updating, maintaining, and sharing NEPA-related guidance addressed by this strategy are:

- Informing users of updates
- Educating new users
- Search functions
- Difficulty finding materials online
- Siloed searches across agencies
- Lack of knowledge about existing tools/sites
- Lack of connectivity between sites

Strategy #9 – Persistent Uniform Resource Locators

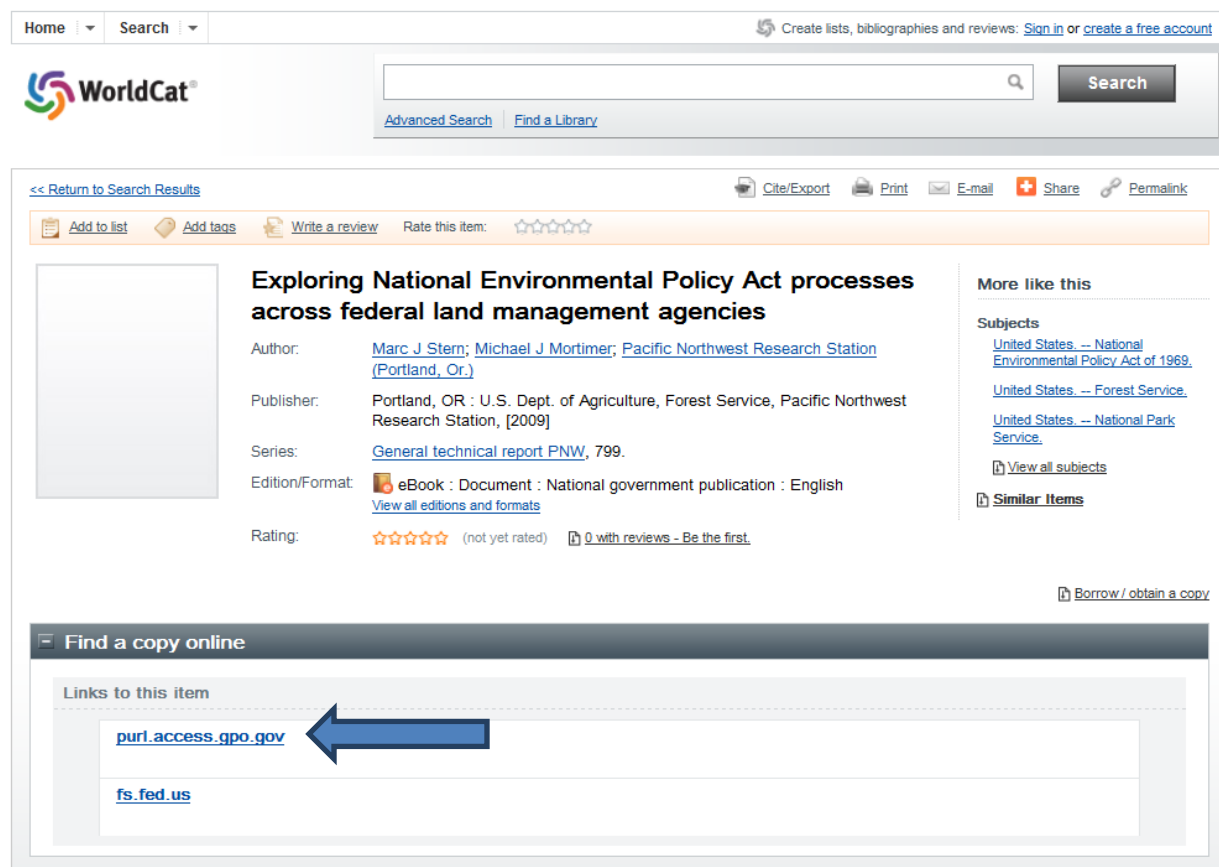
Description

Maintaining links is difficult for a number of reasons. Content can be moved during web site reorganization efforts, causing link errors for both internal linking pages as well as on any external web sites that link to content. One way to address these problems is through PURLs, or persistent uniform resource locators. PURLs provide a stable URL to online information. Other approaches are addressed in other strategies, including:

- Performing regular link checks (see Strategy #4 - Formal Process & Tools for Maintaining and Updating Web-Based NEPA Guidance Materials).
- Organizing a website into easily understood directory structures (URLs) (see Strategy #10 - Internal Search Engine Optimization).

Example

A screen shot of the PURL link used by the WorldCat library site (searches over 10,000 libraries worldwide) is shown below.



Link URL - <http://purl.access.gpo.gov/GPO/LPS122032>

Figure 14. PURL for the WorldCat site

Implementation and Maintenance Requirements

Any organization can set up a system to resolve links and create PURLs for their content. Currently, they are used most often by libraries, academic institutions, and parts of the Federal government. A detailed explanation of exactly how PURLs work and technical details on administering a PURL resolving service was written by the Internet Society (available at http://www.isoc.org/inet96/proceedings/a4/a4_1.htm). At its most basic level, it provides a permanent link to a document as long as the domain remains the same.

While it can be technically difficult to set up PURLs on a domain, many Federal agencies publish their guidance documents via the GPO (Government Printing Office) and can use their PURL support services to maintain access to the document and provide a permanent link. The GPO office maintains these links for their online publications so that the link will always work to direct users to the document. The GPO does maintenance on PURLs and will even route the link to their own system if the item was deleted on the host site (but only if it was archived in the GPO network). If it was not archived, the link will display

a message from the GPO that it is no longer available online as of a given date. For more information on the GPO PURL program, visit the Federal Library Depository Program online at <http://www.fdlp.gov/collections/building-collections/614-purls>.

To discover whether or not the GPO has created a PURL for a document, search the *Catalog of U.S. Government Publications* (available at <http://catalog.gpo.gov>). Below are two examples of records from the GPO Catalog (only some of the fields from each record are shown here). The field named “Internet Access” provides the PURL for the document. If a PURL has not yet been created, a request to make one can be submitted to the GPO.

Title: Exploring National Environmental Policy Act processes across federal land management agencies [electronic resource]
Publisher Info: Portland, OR: U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station, [2009]
Internet Access: <http://purl.access.gpo.gov/GPO/LPS122032>

Title: Guidance for the use of latest planning assumptions in transportation conformity determinations [electronic resource]: revision to January 18, 2001 guidance memorandum /
Author: United States. Environmental Protection Agency. Office of Transportation and Air Quality.
Publisher Info.: [Washington, D.C.] : U.S. Environmental Protection Agency, Office of Transportation and Air Quality, Transportation and Regional Programs Division, [2008]
Internet Access: <http://purl.fdlp.gov/GPO/gpo14162>

State agencies can also make use of PURLs. The Online Computer Library Center (OCLC, a non-profit organization supporting libraries worldwide), provides PURL support at its site <http://purl.oclc.org>. Users can register and manage PURLs using the tools available. Their FAQ provides detailed information on how PURLs work and how users can utilize the site to help resolve PURLs as well as creating partial redirects. Users must have administrative rights to the domain site in order to manage PURLs. This topic is discussed in depth within their FAQ at this page; <http://purl.oclc.org/docs/faq.html#toc2.4>. Working with their IT department, any state agency can set up a PURL management program with relatively little time and effort. Training for content providers typically involves providing explicit instruction on appending a specific URL preceding any link to content within the site to create a PURL.

PURLs are similar in function to the Digital Object Identifier (DOI) system in that both are used to provide permanent links to documents. However, the DOI name works independently of a domain. It was developed by trade associations in the publishing industry to address the issue of providing permanent links to copyrighted material. Should content be sold to another publisher, the original DOI would still work as the registration would follow the current registered content owner. While state agencies could possibly use this standard, it involves paying to register via one of the Registration Agencies (see the current list at http://www.doi.org/registration_agencies.html). It is not likely to be a useful tool for state agencies at this time, but as the system develops further there may be more push for state agencies to use it for permanent link management.

Advantages and Disadvantages

The advantages of using PURLs to provide links to documents are many. They encourage libraries and other agencies to more readily link to a resource as they will see that it is a stable link with an implied commitment to maintain access to the content. PURLs are also shorter, which can make them more stable when used in various databases which may have maximum field length restrictions. If agencies are able to

take advantage of the GPO's PURL support program it will eliminate agencies' IT support to create URL resolving solutions within their own domains. State agencies will also benefit from implementing PURLs via OCLC; once the initial scripts are written, content providers can update them easily.

Common Challenges Addressed

The common challenges associated with updating, maintaining, and sharing NEPA-related guidance addressed by this strategy are:

- Keeping guidance up to date, including web sites
- Search functions
- Updating hyperlinks

Strategy #10 – Internal Search Engine Optimization

Description

Most modern websites, including those used by state DOTs to distribute environmental guidance, provide a search option to allow visitors to find webpages and documents via keywords. This functionality is powered by an internal search engine which provides two main functions: 1) crawl (or scan) the website reading every webpage and document to create a word index of all information and 2) provide a mechanism to search across that word index. This strategy addresses best practices in organizing a website to optimize the internal search engine and provide more relevant results.

The best practices may depend on the internal search engine used. There are several typical search engines used on most websites. The search engines listed below are three of the most popular (with the Google products in heavy use in our small sample of state DOT websites):

- **Google Search Appliance** – The Google Search Appliance is a paid product that includes a dedicated server (installed in the state's data center) and the Google search software. It is currently being used by the Alaska Department of Transportation and Public Facilities and the New York State DOT. (AK, NY)
- **Google Custom Search** – Google Custom Search is a free service that allows a website to perform a search, using Google behind the scenes but with results limited to just the state's website, and present the results within the same website. It allows a state to easily re-use the power and accuracy of Google search while providing the user a consistent web experience. This engine is being used by Caltrans, Virginia DOT, and South Dakota DOT.
- **Solr** – Solr is an open-source search engine that provides complete customization and tailoring. It does not appear to be used heavily in state DOTs given a small sample of states. However, it is used to power search in many high-traffic websites like the White House, Ticketmaster, Sears, and Netflix.
- **Others** – There are numerous other third-party companies that provide paid search engines.

There is a science and art to improving search results on sites like Google and Bing. Many of those same practices can be used on a state's website to improve their own internal search engine results:

- **Include informative metadata for all webpages and documents** – Each webpage/document should have standard metadata applied to help describe the content, beyond just the content of the page/document. This includes the standard metadata tags for title, author, description, keywords, and date. Adding synonyms for important keywords can help a large audience find information,

even if they use non-standard terms (Ex: a visitor may use “ICE”, “secondary impacts” or “indirect and cumulative effects”). States should be careful to include informative metadata, and not just copy the page title into the description and keywords fields.

- **Ensure webpages have HTML titles** – A special HTML code is used to give a webpage a title. Website authors should ensure that this field is completed properly. Search hits in the HTML title are often given more weight than search hits in the webpage body.
- **Utilize an informative website directory structure** – Organizing a website into easily understood directory structures (URLs) can allow search engines to utilize hits in the directory name to help provide context and relevancy for matches. NYSDOT has good directory structures with each directory using an informative name that allows the search engine to determine how the page fits within the rest of the site (Ex: <https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm/chapter-4>). These are often called pretty URLs in that the URL is easily read and understood by both a website visitor and search engine. An ugly URL would utilize query strings and IDs that are not easily understood (Ex: <http://www.state.gov/page?id=38892HJ&cat=6E>). Training content providers to follow best practices for naming folders and files can also assist in easier link maintenance. An example is to remove spaces in file names and to keep file names short. Each space in a file name becomes three characters when converted into a link. For example a document with the file name “Space and Time.pdf” when uploaded to the web site www.yourwebsite.com would become <http://www.yourwebsite.com/space%20and%20time.pdf>. If the document location includes folders with spaces in the name this is compounded. Some agencies have unique document IDs assigned to linked content rather than titles based on the name of the document or contents of the document. These further shorten the length of the link, but it does require a database or other method for tracking and assigning unique IDs.

Another best practice is to implement full-text search engines in web applications in addition to the overall website search. In addition to the site-wide search engine, many websites have sub-sites or applications with their own search mechanism. Many times, these custom applications do not use a full-text search engine, but should. For example, the State Practices Database, does not use a full-text search engine. Searching on the terms “group composed” returns a single hit for Virginia DOT document.

The screenshot shows the 'Environmental Review Toolkit' website. The 'Streamlining/Stewardship' tab is selected. On the left is a navigation menu with links like 'Program Overview', 'SAFETEA-LU', 'Conflict Resolution', 'State Practices Database', 'Newsletters', 'Eco-Logical', 'Performance Reporting', 'Transportation Liaison CoP', and 'Streamlining Contacts'. The main content area is titled 'Search Results' and shows a search for 'group composed'. A red circle highlights the search term 'group composed' in the search bar. Another red circle highlights the search results, which include details for the 'FHWA/VDOT/SHPO Historic Structures Task Group (HSTG)'. A red arrow points from the search term to the results. The results show categories, state, organization, contact, title, email, phone, and description. The description states: 'The Historic Structures Task Group (HSTG) is an interdisciplinary group composed of representatives of the Virginia Department of Transportation Administration (FHWA), the ...[click for more]'. The last updated date is February 17, 2010.

Screen clipping taken: 5/7/2012 7:00 AM

Figure 15. FHWA State Practices Database search results

However, searching on slight variations of those terms, easily handled by a full-text search engine, returns no results. For example, searching on “groups composed” or “composed groups” returns no hits.

The image shows two side-by-side screenshots of the 'Environmental Review Toolkit' website. Both screenshots show the 'Streamlining/Stewardship' tab selected. The left screenshot shows a search for 'groups composed' with the keyword 'groups composed' in the search bar. The search results show 'No records found.' The right screenshot shows a search for 'composed group' with the keyword 'composed group' in the search bar. The search results also show 'No records found.' Both screenshots show the same navigation menu and search results layout as Figure 15.

Figure 16. Lack of search results with slight variations on terms

Another approach to help site visitors who wish to search by a specific topic is to provide a drop-down list of searchable categories. Using this approach, site visitors will not have to guess at the terminology used on a specific site – it will be provided for them in the list. Many state DOTs will have their own set

of categories to include in a drop-down list. Other agencies may benefit from the site organization and search menus provided on the State Practices Database (see Strategy #8 – Expanded use of Existing Reference Sites).

Example

Consider the VDOT page on [Environmental Requirements of Transportation Projects](http://www.virginiadot.org/business/environmental_requirementsTEP.asp). The page does correctly use an HTML title and has a relatively informative, pretty URL. However, the actual page metadata does not provide any extra value or include additional words that could help visitors find the page.

★ Good use of HTML title

★ Decent pretty URL

! Sparse metadata that adds no other description of the content and does not help with searching

NAME	CONTENT
subject	VDOT
revisit-after	31 days
ROBOTS	index, follow
category	Transportation
resource-type	document
copyright	This document copyrighted by VDOT
description	Enhancement projects are federally funded requiring a National Environmental Policy Act (NEPA) document before any land acquisition or construction can begin.

Figure 17. Sporadic use of metadata on a webpage

Implementation and Maintenance Requirements

Ensuring that webpages and documents include informative metadata and the HTML title is not a complex task and does not require a large amount of effort. Adding this metadata can be accomplished

over a period of time, as resources permit. Depending on the website technology used, it could be performed by subject matter experts without IT support.

Utilizing an informative website directory structure can be a much harder task. It may involve a re-design of a website and its sitemap (including re-mapping all existing links). It also may require changes to the technology (web content management system) to generate pretty URLs. This could be a significant IT investment depending on the current technology used.

Advantages and Disadvantages

This strategy has several advantages:

- Many of the best practices (such as adding metadata) require a low level of effort and can usually be done with non-IT staff (possibly even temporary hires or interns).
- The work can occur over time, as resources permit.
- The effects can be seen as soon as the search engine re-crawls the page (usually overnight).

There is one disadvantage:

- The effort to redesign the website's directory structure could be significant and require IT resources and coordination.

Common Challenges Addressed

The common challenges associated with updating, maintaining, and sharing NEPA-related guidance addressed by this strategy are:

- Search functions
- Difficulty finding materials online

Strategy #11 – Modern Techniques to Highlight Content Updates

Description

Visitors who return to a website again and again, such as NEPA practitioners looking for guidance on a particular topic, will often navigate straight to what they need, without looking at a website overall to see what might be new or updated. One strategy to help raise the awareness of those using environmental guidance when there is new or updated material is to use modern website techniques to highlight changes. These techniques include:

- Having a history page to document changes to guidance
- Highlighting changed sections with an eye-catching “New” or “Updated” icon
- Highlighting changed sections in a “What’s New” area of the environmental guidance home page
- Highlighting changed sections in an enhanced footer of the website
- Including the page's last modified timestamp somewhere on the page to indicate the recency of information to the site visitor

Example

Several DOTs are already using these techniques, but they are not used consistently.

1. Caltrans has a detailed posting history page to document changes to their Standard Environmental Reference.



Figure 18. Caltrans Posting History page




2. Caltrans has a few references to updates that use a “New” icon to illustrate new content. However, DOTs should remember to remove the icon after a set period of time (like 90 days).

Environmental Handbooks

Caltrans issued the original Environmental Handbook in 1975 as a written compendium of guidance and procedures for processing environmental documents. Since that time the number of handbooks has grown to four:

- Volume 1 - General Guidance for Compliance (formerly Environmental Process, Procedures and Documentation) is being updated incrementally and is only available [on-line](#).
- Volume 2 - Cultural Resources (Archaeological and Historical) (January 2004) some of the chapters and exhibits are available [online](#). This is work in progress. Chapters and Exhibits will be posted as they become available. Chapters have been reorganized better to reflect the sequential order of cultural resources studies. Links have been added to access relevant legislation and other guidance available on the Internet. Some of the chapters and exhibits are currently being revised and will be posted as soon as they are available.

On January 1, 2004 the Department began implementing a Section 106 Programmatic Agreement to be used for state and local projects for complying with Section 106 of the National Historic Preservation Act of 1966, as amended. The Programmatic Agreement streamlines several cultural resource processes, which are described in Volume 2.

- Volume 3 - Biological Resources (January 2000) is available as a [PDF download](#)  (228 kb) or [online](#). This volume provides guidance on the identification and evaluation of biological resources, processing of biological resource documents, and implementation of biologically-related construction, maintenance, and encroachment activities. Volume 3 of the Environmental Handbook should be used in conjunction with other project planning and development manuals as well as Environmental Handbook Volume 1.
-  Volume 4 - Community Impact Assessment, (October 2011) describes the methodological approaches and various sources available for obtaining information on the effects of transportation projects on the community. Key topics include social, economic and public services impacts, land use, and growth. Volume 4 has been updated to include recent methodologies for conducting a Community Impact Assessment. A chapter on Environmental Justice has been included. Information on creating a community profile has been expanded and includes new sources for data. There are also updated processes for analyzing farmland impacts including instructions for completing the required farmland conversion forms. Available as a [PDF download](#)  (996 kb) or [online](#).

In addition, two handbooks are in preparation:

Figure 19. Caltrans use of a “New” icon

- VDOT includes the page's last modified timestamp on the page to indicate how recent the information is.

Virginia.gov Online Services | Commonwealth Sites | Help | Governor Search Virginia.Gov

VDOT Virginia Department of Transportation **Business Center**

Home > Business > Environmental Requirements for Locality Administered Projects > Transportation Enhancement Projects Contact Us | Search VirginiaDOT.org GO

Environmental Requirements for Transportation Enhancement Projects

Enhancement projects are federally funded requiring a [National Environmental Policy Act](#) (NEPA) document before any land acquisition or construction can begin. The NEPA document is an "umbrella" document that demonstrates compliance with a number of different environmental laws, regulations, and Executive orders, including [Section 106](#) of the National Historic Preservation Act, the [Clean Water Act](#), and many others.

VDOT will complete the NEPA document and supporting coordination for all Enhancement projects with Project Administration Agreements executed after October 2008. For projects with agreements executed prior to October 2008, VDOT can complete the NEPA document and supporting coordination at the Sponsors request. VDOT will provide Sponsors with an estimate of time and cost for environmental work on an Enhancement project.

Sponsors are responsible for obtaining any state/federal water quality permits (for guidance see Water Quality Permit & Natural Resources Due Diligence [checklist](#)) and performing necessary due diligence for hazardous material issues (submitted to VDOT on Hazardous Materials Certification Due Diligence [form](#)).

Close coordination on environmental requirements between the Sponsor and the [VDOT District Environmental Manager](#) will be necessary so that project scopes, plans, schedules, and budgets accurately reflect the cost, requirements, and duration of the environmental work. Please contact your District Environmental Manager directly to determine your project specific environmental requirements.

Environmental Commitments

If any environmental commitments have been identified during agency coordination, the Sponsor is responsible for ensuring they are implemented at the appropriate time. Implementation of environmental commitments is not optional, but required. Environmental commitments for Enhancement projects can include, but are not limited to, conducting an archaeological survey, providing the Virginia Department of Historic Resources (VDHR) with copies of final plans before construction, or having a qualified archaeologist monitor during ground disturbing activities. Once the Sponsor has implemented the environmental commitments, documentation to that effect must be forwarded to the VDOT District Environmental Manager.

Failure to implement environmental commitments may jeopardize FHWA's federal funding of an Enhancement project.

Forms:

- [Hazardous Materials Due Diligence form](#) (EQ-121)

Guidance:

- [VDOT District Environmental Manager Contacts](#)
- [Water Quality and Natural Resources Due Diligence checklist](#)

Page last modified: July 14, 2011

Connect With Us...

Flickr Facebook RSS Twitter YouTube

© 2012 Virginia Department of Transportation | WAI Compliance | Freedom of Information Act
This website includes hyperlinks to sites neither controlled nor sponsored by VDOT or the Commonwealth of Virginia. Links may open in a new window.
Some resources on this site require the Adobe Reader and Flash Player and the Microsoft Word, PowerPoint and Excel viewers.
If you wish to receive this content in an accessible format per Section 508 of the federal Rehabilitation Act, 29 U.S.C. § 794 (d), please call 800-367-7623.

Figure 20. VDOT's use of a page timestamp

4. NYSDOT provides a comprehensive comparison between their 2008 version of their Environmental Manual and their evolving changes from 2010. The comprehensive comparison documents the dates of revisions and also warns visitors looking at the old version when specific sections have been updated.

New York State State Agencies Search all of NY.gov

DEPARTMENT OF TRANSPORTATION

HOME TRAVEL CENTER BUSINESS CENTER

Jobs About NYSDOT Commissioner Forms News & Events Projects Programs & Services Safety Webcasts How do I? ▾

MANUALS AND GUIDANCE

The Environmental Manual (TEM)

> DIVISIONS > ENGINEERING > ENVIRONMENT > MANUALS AND GUIDANCE > THE ENVIRONMENTAL MANUAL (TEM)

Engineering Division - Office of Environment

The Environmental Manual

The Environmental Procedures Manual is undergoing a revision/update. It is being reformatted to provide updated guidance that better meets the needs of the users and that is more closely aligned with other Department guidance. It will also be renamed. It will now be called The Environmental Manual (TEM). It will continue to be the repository for Department guidance on environmental issues.

The new Sections (TEM) are listed in the left hand column. The existing Table of Contents (EPM) is shown on the right. As the new Sections undergo clearance review and are issued they will appear as links.

2010 (TEM)	1998-2008 (EPM)
<ul style="list-style-type: none"> 1.0 Introduction 	Introduction
<ul style="list-style-type: none"> 2.0 Environmental Policy for Department of Transportation 	
<ul style="list-style-type: none"> 3.0 Environmental Roles and Responsibilities 	
<ul style="list-style-type: none"> 4.1.1 NEPA (National Environmental Policy Act) <ul style="list-style-type: none"> 4.1.1.11.D.1 INTERPRETIVE GUIDANCE FOR THE NEPA ASSESSMENT CHECKLIST (EB 10-043) 4.1.2 SEQR (State Environmental Quality Review Act) 4.2 Social 4.3 Economic 	Chapter 2- Cultural Resource/Socio-Economic /Process
<ul style="list-style-type: none"> 4.4.1 Wetlands 4.4.2 Surface Water Bodies and Watercourses 4.4.3 Wild, Scenic, and Recreational Rivers EB 11-016 4.4.4 Navigable Waters 4.4.5 Floodplains 4.4.6 Coastal Resources EB 10-036 4.4.7 Aquifers, Wells and Reservoirs 4.4.8 Stormwater Management 	Chapter 4-Water/Ecology

Figure 21. NYSDOT's comparison of previous environmental guidance

5. The Strategic Highway Research Program's Transportation for Communities (TCAPP) website utilizes a "What's new in TCAPP" section on the Home page to highlight changes. It also uses a detailed enhanced footer with a full list of page links and a "New" icon for pages that have changed. Usability studies and TCAPP's own web traffic analytics have proven that enhanced footers are highly used by site visitors. Since they have the added benefit of appearing on every page, they are also a good mechanism for highlighting changes to the site. Advertising updates in the footer will help communicate changes to the user no matter what page they use to enter the site.

BETA
This draft website and its contents were developed by ICF International; TRB makes no representation or warranty of any kind (see disclaimer).

Transportation for Communities

Advancing Projects through Partnerships

Search

Print | Login | Sign up | Contact Us | About | Glossary

Home | **Decision Guide** | **Assessment** | **User Portal** | **Applications** | **Forum** | **Library**

What is TCAPP?

Whether you are a practitioner, resource specialist or stakeholder - using *Transportation for Communities - Advancing Projects through Partnerships (TCAPP)* can improve how you develop, prioritize, and inform transportation plans and projects. TCAPP is a decision support tool, built from the experiences of transportation partners and stakeholders, which provides how-to information when it is most needed.


How do I get started?

The information on TCAPP is extensive, but it does not have to be understood and used all at once. Choose the best path to find what you need.

The [Decision Guide](#) is the foundation of TCAPP. Use it to access detailed information about decisions made in long range planning, corridor planning, programming, or environmental review.


What can TCAPP do for me?

View this short video to become acquainted with TCAPP.




How does TCAPP work in the real world?

See how others have used TCAPP to support real-world projects. Washington State DOT used the [Corridor Planning Application](#) to define the first phase of the SR 509 corridor project.



What's new in TCAPP?


Both technical and policy decisions are required to reduce greenhouse gas (GHG) emissions. [Greenhouse Gas and Transportation Decision Making](#) shows how to support both.



Recent TCAPP Additions: [Linking the IEF and the Decision Guide](#)


Not sure what obstacles are ahead?

It is often difficult to know what's wrong when plans and projects hit roadblocks. [Assessment](#) can help identify and overcome these barriers.



What are your peers saying?

Share your ideas and consider others in the [TCAPP forum](#).



LONG RANGE TRANSPORTATION PLANNING

LRP-1 Approve Scope of LRP Process
LRP-2 Approve Vision and Goals
LRP-3 Approve Evaluation Criteria, Methods and Resources
LRP-4 Approve Project Description
LRP-5 Approve Final Recommendations

PROGRAMMING

PRO-1 Approve Revenue Sources
PRO-2 Approve Methodology for Identifying Project Costs and Criteria for Allocating Revenue
PRO-3 Approve Project List Drawn from Adopted Plan Scenario or Solution Set
PRO-4 Approve Project Prioritization


CORRIDOR PLANNING

COR-1 Approve Scope of Corridor Planning Process
COR-2 Approve Problem Statements and Opportunities
COR-3 Approve Goals for the Corridor
COR-4 Search Corridor on Scope of Environmental Review and Analysis
COR-5 Approve Evaluation Criteria, Methods and Resources
COR-6 Approve Solution


ENVIRONMENTAL REVIEW/NEPA MERGED WITH PERMITTING

ENV-1 Approve Scope of Environmental Review
ENV-2 Approve Methodology for Identifying Project Impacts
ENV-3 Approve Evaluation Criteria, Methods and Resources
ENV-4 Approve Project Description
ENV-5 Approve Final Recommendations

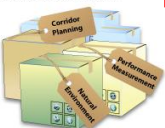
Find information tailored to FHWA, resource agencies, MPOs, or state DOTs at the [Partner Portal](#).



Find guidance and support for involvement in transportation decision making in the [Stakeholder Portal](#).



Start with small improvements that address a challenge. Choose one of the [Applications](#) for information packaged around a specific topic.



Also visit:
[Performance Management](#)
[Transportation Projects Impacts \(TPICS\)](#)
[Visioning and Transportation](#)

Features	User Portals	Applications	Performance Measures
Decision Guide	Partner Portal	Long Range Transportation Planning	Visioning and Transportation
Assessment	Stakeholder Portal	Corridor Planning	Integrated Planning
Forum		Integrated Programming and Fiscal Constraint	Land Use
Library		Environmental Review Merged With Permitting	Air Quality
	Related Research	Stakeholder Collaboration	Natural Environment
	Performance Management	Linking MPO Planning and NEPA	Capital Improvement
	Transportation Project Impacts (TPICS)	Streamlining a Bottleneck Project	Safety and Security
	Visioning and Transportation	Cumulative Effects Assessment and Alternatives (CEAA)	Human Environment
			NEW GHG Integration

We invite your comments/concerns about this website and its contents. Please send us an email at transportationforcommunities@gmail.com.

Figure 22. Transportation for Communities – Advancing Projects through Partnerships use of an enhanced footer with “new icon” and an area to highlight new material (transportationforcommunities.com)

Implementation and Maintenance Requirements

The techniques described in this strategy are not hard to implement or maintain. Creating a detailed history page can be done by DOT staff and would require little IT support. The best time to document the changes is when revisions are taking place since the updates are well known. The other techniques to include the use of “New” icons, page timestamps, and a “What’s New” section on the Home page and footer may require some IT support, but it is not significant.

Advantages and Disadvantages

This strategy has several advantages:

- Highlighting new information quickly informs site visitors and helps them understand and comply with the environment guidance
- Clear documentation of guidance revisions on the website can also help DOT staff answer questions and research issues

There is one disadvantage:

- Some of the techniques may require coordination with IT support.

Common Challenges Addressed

The common challenges associated with updating, maintaining, and sharing NEPA-related guidance addressed by this strategy are:

- Keeping guidance up to date, including websites
- Informing users of updates
- Educating new users
- Coordinating with IT support

Strategy #12 – Centralized Search Site

Description

A centralized search website that automatically indexes (scans every page and records the location of each word like a book index) DOT environmental guidance websites and documents, could be a valuable resource for transportation practitioners. Over the last ten years, advances in the art and science of text searching and the introduction of open-source search engines, like Apache Solr or Sphinx, have made it possible to provide cost effective, powerful and robust search websites. This strategy involves the development of a centralized search website that indexes environmental guidance from a set of official, registered URLs. Note that this strategy is not a document library – no guidance materials would be hosted on the website, rather it would be used to search other pages where guidance materials are hosted and provide access to them. The search engine would implement modern techniques to provide a powerful search experience:

- Maintain a list of registered URLs to official state DOT guidance websites and documents
- Provide full-text searching across websites and files (Ex: PDFs, Word documents, PowerPoint documents...)

- Provide hit highlights to bold the matching search terms within the context of a sentence to allow a user to easily determine the quality of the match
- Support word-stemming so that slight word variations would still return matches (“roads” matches “road”, “freeze” matches “freezing”)
- Support synonyms widely used in the transportation industry (“ICE” matches “secondary impacts” matches “indirect and cumulative effects”)
- Provide search facets to easily allow a user to filter the existing set of search results by useful categories like state, topic, and year
- Provide intelligent relevancy ranking to order frequently viewed, popular, and better matches near the top of the search results

Figure 23 shows a conceptual diagram of how a centralized search site could index the environmental guidance on state DOT web pages and documents. The application could crawl the entire environmental guidance section of state’s website or target specific files on the website.

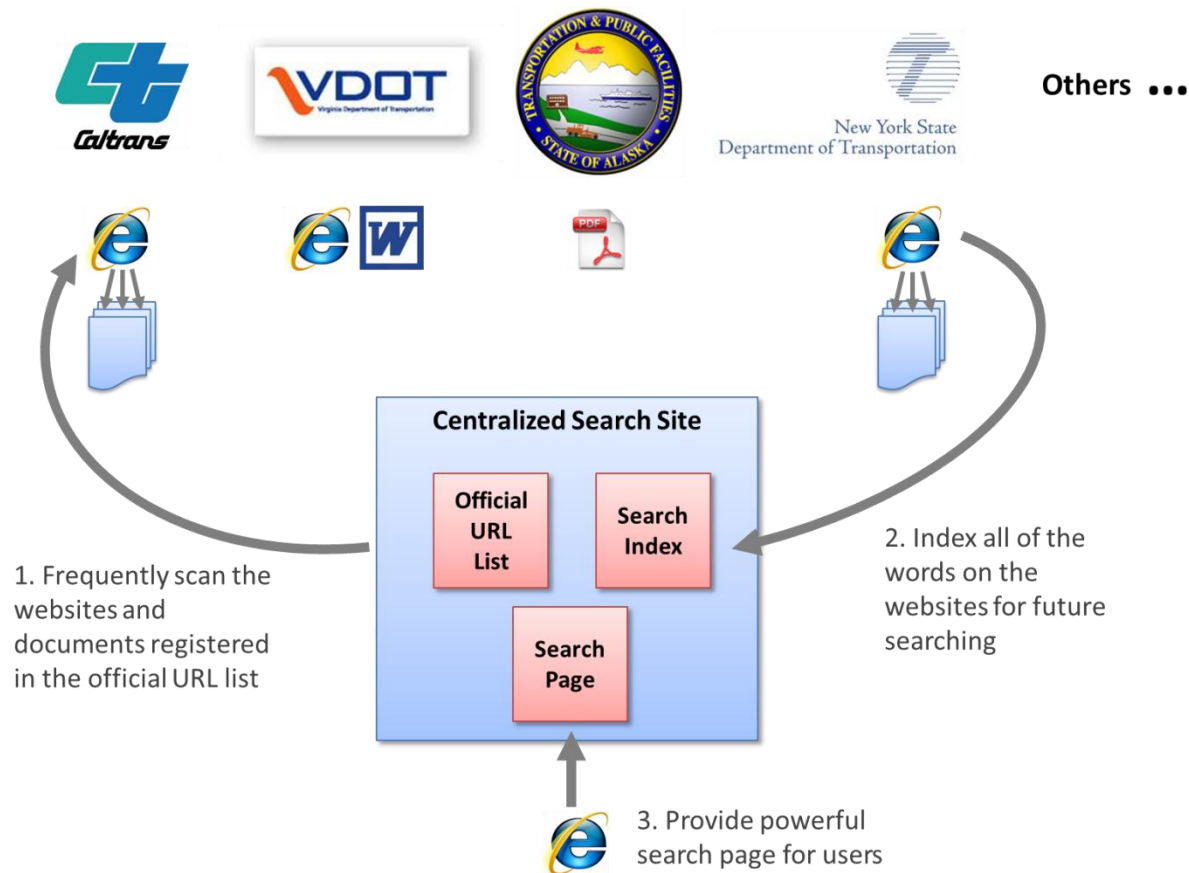


Figure 23. Conceptual diagram of a centralized search site

This technique would offer a robust search mechanism, focused on state environmental guidance, and provide an excellent search experience to the user.

Example

The NCHRP 20-63B project to redesign the Research Performance Measures website recently introduced a powerful full-text index and search page using Apache Solr. Figure 24 shows the search results page after a search on the term “plan.” The search mechanism included many of the search techniques described above including hit highlighting, word stemming, and search facets. Initial response to the functionality has been very positive.

The screenshot displays the RPM website's search results for the query "plan". The interface includes a top navigation bar with links to "VIRGINIA DASHBOARD", "ANNUAL PROGRAM", "PROJECTS", and "REPORTS". A search bar at the top right shows the query "plan" and a "Search" button. On the left, a "Filter By" section provides search facets for "Agency" (Virginia Department of Transportation (5)), "National Study Codes" (Bridges and other structures (1), Construction (1), Design (1), Highways (5), I30: Materials (1), Operations and Traffic Management (3), Pavements (1), Planning and Forecasting (4), Public Transportation (1), Safety and Human Factors (2)), and "Start Year" (2010 (2)). The main content area lists 5 search results, each with a title and a brief description. The first result is "Pilot Implementation of a Resource Guide to Enhance Incorporation of Safety into the Regional Planning Process". The second result is "Structural Design Guidelines for Concrete Bridge Decks Reinforced with Corrosion-Resistant Reinforcing Steel Bars". The third result is "A Methodology to Forecast Peak Spreading". The fourth result is "Guidelines for Edge and Centerline Markings on 16- to 20-Foot-wide Roads". The fifth result is "Identifying and Prototyping Integrated Corridor Management (ICM) Strategies for Application in Virginia". Annotations highlight specific features: "Search Facets" points to the filter section, "Word Stemming" points to the word "planned" in the second result, and "Hit Highlighting" points to the word "planning" in the fifth result.

Figure 24. Research Performance Measures search results page

As with many of the other strategies described, this strategy builds on others and can be combined with others. For example, a Centralized Search Site could be used in conjunction with Strategy #1 Glossary and Strategy #10 Internal Search Engine Optimization. The development of a glossary could easily lead to the development of a synonym list (ex., indirect effects, indirect impacts, secondary effects...). This synonym list could be configured in a full-text search index to provide a robust user search experience. Search best practices recommend configuring the search index tool with the synonyms before indexing the site. This is as simple as subject matter experts sending synonym lists (with frequent updates over time) to IT staff to configure in the search engine. Best practices also recommend presenting the results of synonym hits initially because the most relevant hits may be from the synonym words, not the exact

words typed in by the user. However, the site should also allow the user to search on just the exact words and exact word order. Most search engines provide this functionality if the user types in the terms surrounding by quotes (ex., searching on “indirect effects” instead of just indirect effects).

Implementation and Maintenance Requirements

Implementing a centralized search site would involve creating a custom web application. This means the site would need to be designed, developed, tested, and maintained. All existing state DOT environmental websites with their URLs are captured in the inventory developed through Tasks 1 and 2 of this project; providing a good foundation for developing a centralized search page. Additional effort from subject matter experts would be required to identify appropriate facets and synonyms for the centralized search page. Funding would need to be secured for the effort and a site owner needs to be defined to manage the site.

Advantages and Disadvantages

This strategy has several advantages:

- Provides a robust search mechanism to allow users to search within a state’s documentation and also across states’ websites
- Allows states to continue to maintain official documentation on their own websites
- Supports industry accepted synonyms to allow users to search on industry variations of the same terms (something that Google does not provide)

There are a couple of disadvantages:

- This strategy requires development of a web application, which could be costly.
- It also would require a website owner to be named/nominated that can maintain the site on behalf of the participating states.

Common Challenges Addressed

The common challenges associated with updating, maintaining, and sharing NEPA-related guidance addressed by this strategy are:

- Informing users of updates
- Educating new users
- Search functions
- Difficulty finding materials online
- Siloed search functions
- Lack of knowledge about existing tools/sites
- Lack of connectivity across existing tools/sites

CONCLUSIONS AND SUGGESTED RESEARCH

Within state DOTs, there is a vast range in the volume and type of NEPA-related guidance materials developed, maintained, and shared. However, most state DOTs are maintaining their materials in electronic format (Internet or Intranet), and most successful practices have been related to using these formats. A number of common challenges were identified through interviews with state DOTs (see Table

2). At the root of all challenges is the need for efficiency – those who manage NEPA guidance materials need to be able to make changes quicker and get the word out easily. Those who use NEPA guidance materials need to be able to find what they need more easily and stay aware of updates and changes.

The strategies section includes recommendations for addressing each of the individual challenges. The recommendations are all related to increasing the efficiency of updating, sharing, and maintaining NEPA guidance materials. The strategies are not exclusive – any agency could choose to implement one or more of the recommendations. In addition, many of the strategies could be implemented by individual agencies in the short- or long- term. The summary of the level of effort to implement and maintain each strategy and expected resulting benefits provided in Table 4, can be used as a guide by individual agencies to pinpoint and evaluate the strategies that might be most useful and easily implemented given their unique circumstances, challenges, and materials. Three strategies – Expanded use of Existing Resource Websites, RSS Aggregator, and Centralized Search Site – require broader coordination across agencies and a higher level of effort to implement. Research and funding to further develop these strategies is recommended.

GLOSSARY OF TERMS

Community of practice (CoP): Subject specialist group (using conversing virtually online) that can share troubleshooting tips and updating challenges. If there is a staffing change, the CoP can bring a new member quick up to speed on the organization's web site updating process. A CoP group/groups allows the organization to leverage collective experience as part of their overall knowledge management processes.

Content Management System (CMS): Software applications used to create websites that allow non-IT to create and edit webpages without requiring knowledge of HTML. Used to organize and facilitate collaborative content creation. The software allows for varying permission from multiple content providers, reduces duplication by tracking uploaded documents, and typically has hyperlink maintenance tools.

Google Custom Search: Free service that allows a website to perform a search, using Google behind the scenes but with results limited to just the state's website, and present the results within the same website.

Google Search Appliance: Paid Google product that includes a dedicated server (installed in the state's data center) and the Google search software.

Hit Highlighting: The practice of highlighting matching search terms (with bolded or colored text) within the context of a sentence. Example: If you search for "**nepa**", a result with highlighting could look like "The National Environmental Policy Act (**NEPA**) is a United States environmental law that established a U.S. national policy promoting..."

Index: In a software or search context, an index is listing of words with references to documents or webpages that contain those words. This is similar to how an index for a book is a listing of words with references to the page numbers where those words occur.

Intranet: Collection of private computer networks within an organization.

Metadata: Information that describes data. In the context of webpages, metadata helps describe the webpage (title, author, description, keywords, and date) beyond just the content of the page/document.

Microformats: A set of simple, open data formats built upon existing and widely adopted standards. Microformats.org has become an authoritative website for detailed specifications for typical semantic formats.

Open-source search engines: Search engine software that is released under open-source licenses, which generally mean the software is free of charge for your use or customization.

Optical character recognition (OCR): Mechanical or electronic conversion of scanned images of handwritten, typewritten or printed text into machine-encoded text.

RSS: Really Simple Syndication (RSS) is a standard format used by websites to announce changes in content. It gives website managers a consistent method for announcing changes to content and website visitors an easy way to learn of important, recent changes without having to constantly re-visit a website and search for updates.

RSS aggregator: Collects news from various RSS feeds and provides a consistent, easy-to-use website to see the update announcements.

Schema: The listing and specifications of each field of data that is part of the standard.

Semantic coding: Adding very detailed, low-level metadata down to the paragraph, bullet, sentence, or word level (this is information within the webpage).

Solr: One of the more popular, open-source search engines that provides complete customization and tailoring.

Word stemming: Reducing a word to its stem or root form, thus, the key terms of a query or document are represented by stems rather than by the original words. This allows for very robust searching on slight word variations (“car” vs. “cars”, “freeze” vs. “freezing”).

Appendix A:

Inventory of State Department of Transportation NEPA and Related Guidance Materials

[Placeholder for inventory – replace]

Appendix B:
Interview Notes

[Placeholder for Appendix B - replace]