AASHTO

PRACTITIONER'S HANDBOOK

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DEVELOPING AND IMPLEMENTING AN ENVIRONMENTAL MANAGEMENT SYSTEM IN A STATE DEPARTMENT OF TRANSPORTATION (DOT)

DOTs face ever-mounting pressure to enhance environmental and business performance and to demonstrate their commitment to environmental stewardship. This Handbook provides recommendations for developing and implementing an Environmental Management System (EMS) to help meet these goals and expectations.

Issues covered in this Handbook include:

- Understanding what constitutes an EMS
- Using Plan–Do–Check–Act for an effective EMS
- Providing environmental and business value to your organization
- Using AASHTO's EMS roadmap
- Applying an EMS to any activity or facility
- Deciding upon a focus for initial efforts
- Identifying expectations and objectives
- Building upon existing successes
- Measuring performance
- Continually improving performance

The Practitioner's Handbooks are produced by the Center for Environmental Excellence by AASHTO. The Handbooks provide practical advice on managing the range of environmental issues that arise during transportation agency activities.

This Handbook is intended for use by managers and others who are responsible for coordinating compliance with a wide range of regulatory requirements. With these needs in mind, this Handbook includes:

- key issues to consider;
- a background briefing;
- practical tips for developing and implementing an EMS.

In addition, key documents and other reference information for this Handbook are posted on the Center's web site at http://environment.transportation.org

Center for Environmental Excellence by AASHTO

American Association of State Highway and Transportation Officials

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Overview



Environmental Management Systems (EMSs) have demonstrated measurable environmental as well as business performance improvements for numerous Federal, state, and local governments and private sector companies throughout the United States over the last decade. Recognizing these benefits, several state departments of transportation (DOTs) have developed and implemented EMSs to achieve similar enhancements in various transportation activities and facilities.

EMSs also offer the means to pursue, as well as demonstrate, an organization's commitment and methods to achieve environmental stewardship. This demonstration of commitment and methods is increasingly reflected in directives, legislation, and stakeholder expectations.

Environmental benefits realized through DOT EMSs include:

- Reductions in the number and severity of compliance incidents,
- Pollution and waste quantity reductions,
- Recovered resources, and
- Streamlined permit and document reviews and approvals.

Business performance improvements attained through these EMS initiatives include:

- Reduced regulatory oversight schedule and cost burdens,
- Faster project delivery and, in turn, labor savings through streamlined reviews and approvals,
- Increased work force efficiency, and
- Cost savings and cost avoidances.

This Handbook introduces EMS concepts, describes basic EMS components that can be applied to any DOT activity or facility, and presents suggestions on how to consider, develop, and implement an EMS. The EMS approach and content described herein are based upon well-established overall approaches as well as detailed actions. At the higher levels of a DOT, an EMS provides the structure to establish (possibly as a component of other strategic and business planning efforts) broad environmental performance goals, objectives, and targets and to assess organizational performance in meeting these goals. At the "detail" level of a DOT, an EMS provides the instructions, training, assignments, and performance monitoring methods to meet performance goals on a day-to-day basis. This Handbook updates, refines, and expands upon the information presented in the *AASHTO EMS Implementation Guide* which was originally issued in August 2003.

Appendix A presents an example that demonstrates how the information provided in this Handbook can be used to develop and implement an EMS in a DOT.

Key Issues to Consider

Considering Use of an EMS

- Is an EMS already in place or are you establishing a new EMS?
- How can you get approval to take the first steps toward an EMS? If management is already interested generally what are the next steps?
- What are the "drivers" (internal and/or external) for establishing or expanding an EMS in your DOT?
- What DOT activity or facility should be the focus of the EMS?

- Who are the stakeholders, internal as well as external, for the EMS?
- Will the EMS be a stand-alone effort?
- What additional resources will you need to establish an EMS?
- How will you define initial responsibilities and expectations?

Developing an EMS

- Who will lead EMS development efforts in your organization? Who will support these efforts? Is a team approach needed?
- How can you identify and select a DOT's EMS objectives, measures, and targets?
- Should you start big or small with an EMS?
- How can you prepare a plan for EMS development and implementation?
- Who would be involved in (i.e., directly support) subsequent EMS efforts? Who would be affected by these efforts?
- How should these personnel be informed of their involvement? When should they be informed?

Implementing an EMS

- What are your basic requirements/desired results for detailed EMS instructions and practices in the selected focus area?
- How can we determine when to use or modify existing initiatives and practices for the EMS?
- How can we integrate an EMS with other quality and continual improvement efforts?
- How can we determine when to develop new EMS practices (e.g. work instructions or responsibilities)?
- Should we develop an EMS manual or document?
- What is contained in an EMS training program?
- How do you roll out the EMS in a unit, region/district, or facility? Does it help to roll out the EMS in stages (e.g., as a pilot in one district or facility)?
- How can you track and use performance monitoring and assessment information?
- What can you do to identify and implement corrective and preventive actions to maintain and enhance performance?
- How do you track EMS performance/results?
- Can anything be done to improve performance?
- How would you use EMS performance information in dealings with regulators? Elected officials? The public? Other stakeholders?

Maintaining an EMS

- Once implemented, can an EMS continue without oversight and guidance?
- Who would keep an EMS going?
- Are there any opportunities for improvement? How would you identify these opportunities?
- What would be the next focus for a DOT's EMS?

Background Briefing

Defining an EMS. *An EMS is the organizational structure and associated responsibilities and processes, procedures, and tools for integrating environmental considerations and objectives into the ongoing management decision-making processes and operations of an organization.* An EMS is not simply an information system, document, compliance checklist, set of plans, or project.

EMS PROCESSES, PROCEDURES, AND TOOLS

Process. A series of activities used to manage environmental performance. Processes are fulfilled through and may include one or more procedures.

Procedure. A defined series of steps used to perform an activity or process. Procedures are documented and communicated to ensure consistency. Consistency is also achieved through training in use of the procedures. Procedures may also be referred to as work instructions or standard operating procedures (SOPs).

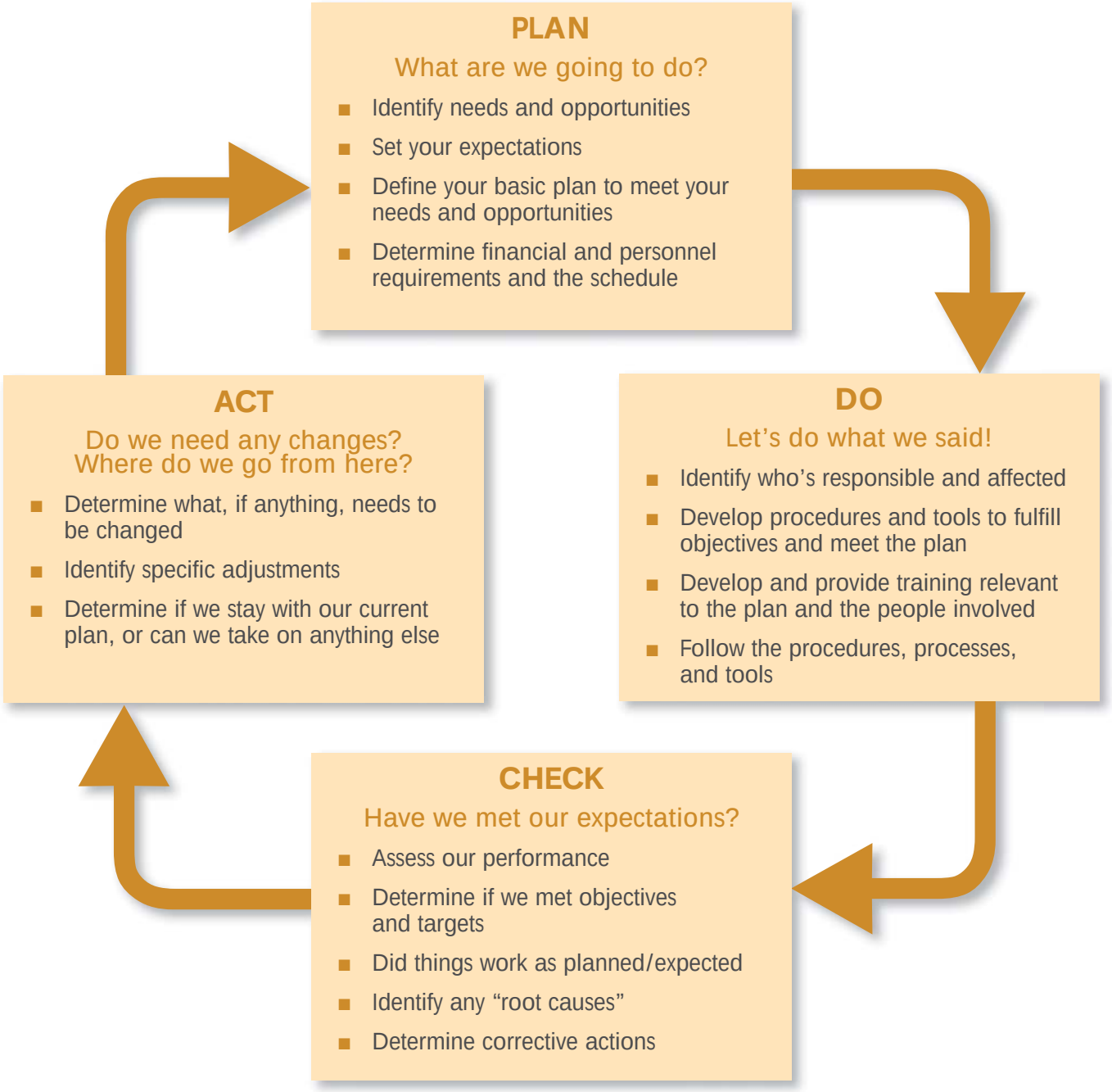
Tool. An aid that facilitates task completion. A tool may be used to reduce the level of effort required for a task, improve consistency, and/or aid in record keeping (e.g. a form, a template, or an electronic data or record capture system).

The above EMS definition incorporates key elements of definitions presented in EPA's Compliance Focused Environmental Management System (CFEMS) guidance and the International Organization for Standardization (ISO) 14001 Environmental Management System (EMS) Standard. The EPA and ISO definitions incorporate additional specific requirements that reflect the compliance and conformance needs of EPA and ISO. In non-enforcement actions, EPA and Federal Environmental Executive EMS information and guidance generally reflects the criteria and approach of the ISO 14001 Standard. The AASHTO definition, originally developed in 2003, provides greater flexibility for DOTs to implement EMSs that meet their specific needs and objectives.

ISO 14001 Use and Certification. ISO is an international organization that has established standards in numerous areas to provide consistency in compliance and conformance throughout the world. ISO 14001 is the Standard for EMSs and is comprised of 17 basic elements and numerous criteria within each element, including requirements for document control and record keeping. Certification to ISO 14001 requires routine third-party audits (costing several thousand dollars a year for a typical DOT unit or facility) and is based on conformance to all criteria. It is important to note that while a very small number of state and Federal government agencies and facilities have obtained certification, DOT implementation of an EMS as described in this Handbook does not require ISO certification. An EMS that is not ISO-certified can provide substantial environmental and business performance enhancements for DOTs. Pursuit of ISO-certification should be considered on its own environmental and business merits.

EMS and Environmental Stewardship. Over the last decade there has been an ever-increasing demand for DOTs to practice environmental stewardship in all facets of their operations—from planning through routine maintenance. Environmental stewardship means making decisions and conducting operations in a manner to protect and improve the environment. An EMS directly supports environmental stewardship by providing the means to routinely and consistently consider (not just on a project-by-project basis) environmental effects and requirements in transportation decision-making as well as day-to-day activities.

The Plan–Do–Check–Act Approach. A common, well accepted framework for any management system that strives for continual improvement is the Plan–Do–Check–Act structure. This framework has been proven over a number of years in a wide variety of applications in both government and industry. The concepts behind this framework, which can be easily understood by personnel at all level of an organization, can be easily adapted for a management system, be it environmental or otherwise. Following is an illustration of the Plan–Do–Check–Act structure—the arrows highlight the systematic continual improvement nature of this approach.



Value of an EMS. DOTs and other public sector organizations that have implemented EMSs have achieved *environmental as well as business benefits.* These include:

- Significant reductions in the time and effort to obtain project and permit reviews and approvals.
- Enhanced and ensured compliance.
- Ensured tracking and fulfillment of project environmental commitments.
- Savings through reductions in resources required and wastes to be disposed.
- Increased productivity—more project work from same work force; no need to revisit work site to correct environmental mistakes.

A recent AASHTO report[1] found that 27 state DOTs either had implemented or were in the process of developing EMSs. This level of activity reinforces the growing awareness on the part of DOTs of the performance achievements available through an EMS.

Elements of an EMS. As developed by AASHTO, and other government and private sector organizations, EMSs are comprised of the following elements which are fundamentally consistent with EPA's Compliance Focused EMS (CFEMS) guidance and the ISO 14001 EMS Standard.

- **Environmental Policy.** Statement of the broad environmental goals and commitments of the organization; the policy should be signed by senior management.
- **Focus.** The activity and/or facility to be addressed by initial and, if applicable, subsequent EMS efforts.
- **Requirements.** DOT directives and regulatory requirements relevant to the focus area and that set minimum compliance and conformance constraints.
- **Expectations.** Performance (environmental and business) objectives, measures, and targets.
- **Responsibilities.** The personnel who will lead EMS efforts as well as the personnel (at all levels) who will use the EMS.
- **Processes, Procedures, and Tools.** Refer to the definitions provided at the beginning of the Background Briefing.
- **Training.** Description of how involved and affected personnel can follow the procedures.
- **Assessment.** Performance evaluation (vis-à-vis expectations).
- **Review.** The actions and responsibilities to attain, maintain, and improve performance.

AASHTO EMS Process Roadmap. The EMS Process Roadmap presented on the following page can be used by transportation professionals at various levels and in various units (environmental as well as non-environmental) to help develop and implement an EMS in their DOT. This Roadmap is based upon the Plan–Do–Check–Act approach and incorporates the elements and qualities described above. The Roadmap sequence and steps are fundamentally consistent with the EPA's CFEMS and the ISO 14001 EMS Standard.

Phases of EMS Efforts. Any DOT's use of an EMS moves through four basic phases—consideration, development, implementation, and maintenance. Following are descriptions of these phases with Plan–Do–Check–Act references included in parentheses.

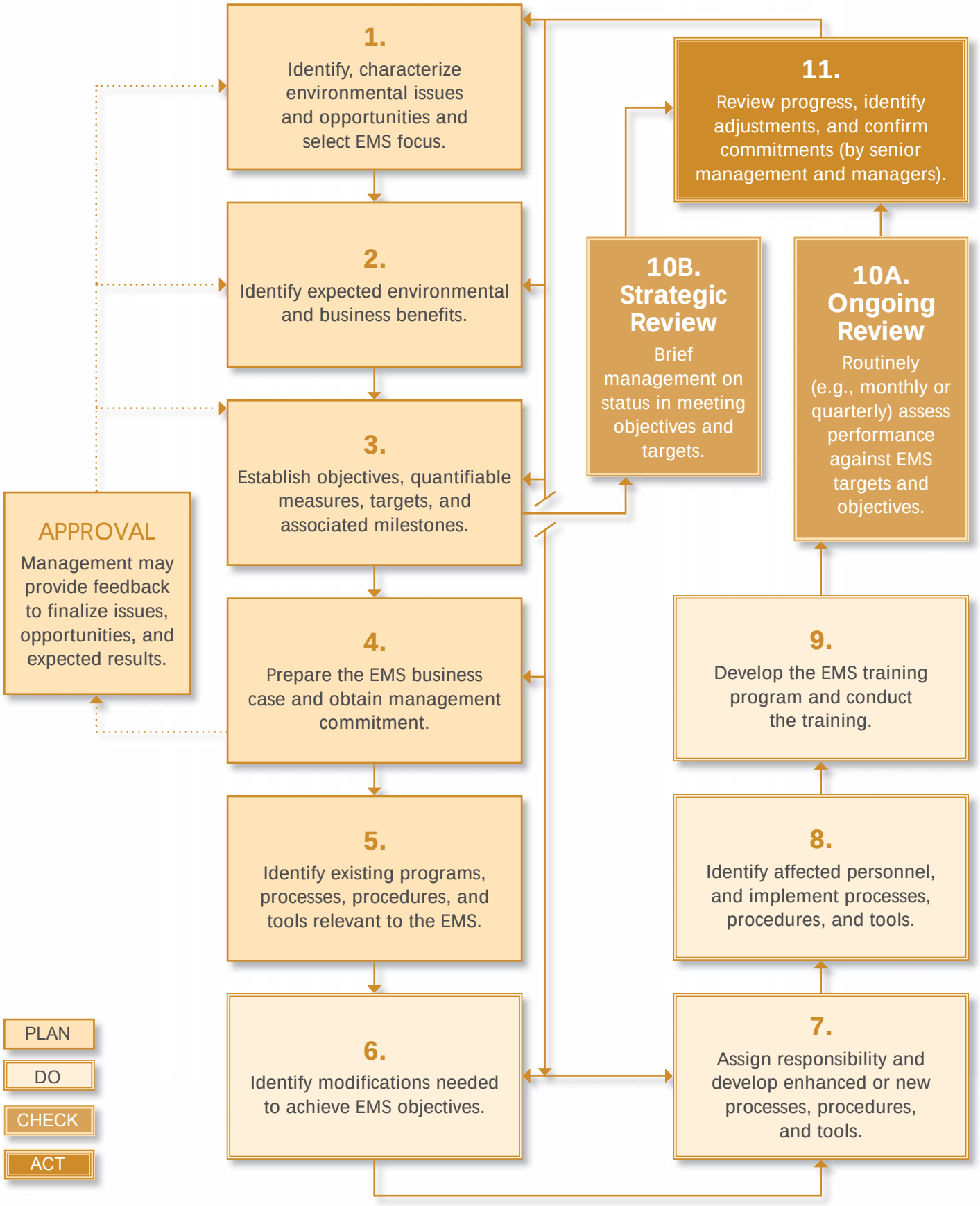
- **Consideration (Plan).** The DOT evaluates its overall environmental constraints and opportunities and determines that an EMS can be of value.
- **Development (Plan).** The DOT defines its EMS focus and expectations, and identifies the basic process(es) or activities that the EMS will address.
- **Implementation (Do, Check).** The DOT constructs, uses, and (if necessary) revises the procedures and tools that are required for the EMS.
- **Maintenance (Check, Act).** The DOT reviews its processes and procedures, and uses its tools on an ongoing basis to make sure that performance expectations continue to be met. Through this review, the DOT may find opportunities to improve or expand the focus of the EMS.

Keys to Success. Experience with EMS efforts in public and private sector organizations reveal several common actions that will ensure the success of EMS efforts—from both an implementation as well as results perspective. These keys to success include:

- Provide management commitment—resources, finances, stated commitment, and ongoing oversight.
- Establish clear, measurable expectations—with objectives, and performance measures and targets that address a specific EMS focus.
- Involve all affected employees—in development and implementation.

[1] See AASHTO's Standing Committee on Highways, Subcommittee on Construction, Environment and Human Resources Section, *Environmental Management Systems Implementation Update* (August 2006). This document is available at http://environment.transportation.org.

AASHTO EMS PROCESS ROADMAP



- Incorporate principles of continual improvement—monitor, review, correct, prevent, and enhance.
- Ensure repeatability and consistency—through documentation of, training on, and maintenance of procedures, processes, and tools.
- Capture lessons learned—what worked and what didn't before and now.
- Build on what is in place—adapt initiatives, procedures, processes, and tools; including other continual improvement and quality initiatives.

Practical Tips

The section below on *Considering Use of an EMS* is provided for DOT managers and staff who are just beginning their efforts to determine how an EMS could benefit their organization. If your DOT has already decided to move forward with an EMS, or has an EMS in place, please refer to the subsequent section—*Developing, Implementing, and Maintaining an EMS.*

Considering Use of an EMS

The following actions help a DOT assess the potential applicability of an EMS to DOT activities and facilities. The initiative to begin these actions can originate at any level of a DOT, but management must eventually be involved as they have the ability to commit resources to subsequent efforts.

- **Identify Drivers.** Review recent and current initiatives, directives, and findings to identify "drivers" (i.e., a cause for motivation) that could require or influence interest in an EMS for the DOT. Drivers for an EMS can be internal or external to the DOT. Initiatives may include: calls for stewardship, or growing public and elected official expectations for environmental protection and resource conservation. Directives may include: demand for streamlined project delivery (within the DOT or from FHWA or elected officials), stagnant or constrained budgets, or environmental requirements established by DOT or state management. Findings may include: audit results, compliance agreements, and instances of noncompliance. It should be noted that "drivers", as shown in these examples, address both environmental and business performance.
- **Characterize/Prioritize Drivers.** Prioritize the drivers based on regulatory mandates, specific direction from DOT or FHWA senior management or elected officials, explicit or strongly implied public expectations, and potential to provide measurable business value (reduced permit and review cycles). Using the driver priorities, identify potential focus areas for the EMS. For example, an EMS could focus on certain DOT functions, such as planning, construction, and O&M. An EMS could also focus on certain DOT facilities, such as stockpiles, garages, and rest areas.
- **Apply EMS Principles.** Using the information presented in this Handbook, prepare a brief overview of the ways in which an EMS provides both of the following:
  - The overall structure for enhancing environmental and business performance. As described in this Handbook, the overall structure for an EMS includes: establishing organizational performance objectives and targets, assigning responsibilities to an EMS lead or process owner, authorizing resources, reviewing progress and performance, and identifying further improvements or adjustments.
  - The specific processes, procedures, and tools to address environmental performance in one or more of the DOT functions or facilities. The following section of this Handbook provides information on the specific steps to develop, implement, and maintain an EMS within the overall structure and focused on a function or facility.

  AASHTO and other DOT contacts can help in preparing this overview.
- **Conduct Management Review.** Brief senior management and other directors and managers on EMS concepts, structure, and applicability to the DOT. Useful points to recognize in this briefing include:
  - EMSs can be developed for any DOT facility or activity;
  - An EMS can be managed as a project but it should not be confused as a "once and done" project-type effort—continual improvement is a key;

- The time and money required for an EMS depend on the size (cost, area, number of people involved) and complexity of the activity or facility—recognize that EMS costs do not include costs for compliance;
- DOTs and other organizations have found that taking a staged (e.g., pilot in one area and then roll out in other areas) approach helps to control time and cost, and maximize EMS effectiveness and performance;
- Experience shows that it is helpful to use outside support to guide and facilitate EMS efforts; and
- Outside support will help, but the DOT personnel involved in the EMS effort must accept "ownership" to make the EMS effective in the long term.

- **Decide to Proceed.** As an outcome of the briefing and review, DOT senior management: reaches a decision to move forward with EMS development, designates an EMS lead and support team, and authorizes the resources to conduct initial EMS efforts (refer to Steps 1 through 4 below).

How the Center Can Help

Briefings for DOT management can be developed internally using the information presented in this Handbook. Such briefings can also be arranged, in person or via video conference, through the AASHTO Center for Environmental Excellence. The Center offers the services of experts who have implemented numerous DOT EMSs and have the experience and detailed information to respond to questions that may arise.

Other sources of background information include: the Center's web site, EMS contacts at other DOTs, the FHWA Successes in Stewardship web site, TRB Committee ADC60 presentations, the Office of the Federal Environmental Executive's EMS guidance, and US EPA's EMS Implementation Guides. These materials are available on the EMS Documents and Reports link on the Center's web site at: http://environment.transportation.org.

Developing, Implementing, and Maintaining an EMS

The following sections provide Practical Tips for performing each of the steps identified in the AASHTO EMS Process Roadmap. The numbers and titles in this section refer to the numbers shown on the Roadmap. Following are Tips that apply to all steps.

- **Assign a Team.** Development and implementation of all EMS processes, procedures, and tools cannot be done by one person. Management assignment of a team enables effective and efficient EMS development and implementation. Specific, stated assignment by management ensures that team members recognize their responsibility.
- **Provide EMS Background for the Team.** Members of the EMS Team may not be familiar with EMS concepts and details as presented in this Handbook. Therefore, the Team should be briefed on EMS terminology, concepts, structure, and implementation steps.
- **Appoint a Leader.** Designate an EMS "Lead" or "Process Owner" to guide and coordinate EMS efforts.
- **Provide Broad Representation.** An EMS team with representatives from all potentially affected units/groups: provides the means to identify and address all relevant needs and perspectives, ensures EMS "ownership", and facilitates EMS implementation and maintenance. The EMS Lead/Process Owner does not necessarily have to come from the DOT's environmental unit.
- **Keep the Team Small.** A team with a limited number of members: is easier to manage, can be scheduled to meet more frequently (as needed), and can reach consensus more easily. Work groups can be assigned to address specific actions/needs.
- **Do Not Try to Do too Much.** Select an EMS focus that keeps the effort manageable and do-able within a reasonable time frame—the time frame varies among organizations based on expectations or need. Organizations that have tried to tackle too broad a scope or too many issues and opportunities at one time have encountered delays, at best, or given up on the effort. Remember that development and implementation of an EMS is a process of continual improvement that can be performed in stages.

- **Sequence and Flow.** The Roadmap Steps depict a typical sequence of actions and show efforts to build a case for pursuing further EMS actions. Depending upon the resources available to and expertise of the DOT, the focus for an EMS, and the type and extent of existing programs or initiatives some steps in the EMS Process Roadmap may be conducted concurrently or rearranged slightly in sequence. However, the basic flow—Plan, Do, Check, and Act—has been demonstrated to be effective and efficient.

Appendix A provides an example to show how the Tips presented in each section can be applied to specific DOT activities and facilities. The activity used in this example is a Construction activity.

1 | Identify, Characterize Environmental Issue(s) and Opportunity(ies) and Select EMS Focus

List Environmental Issues. These issues may include: recent compliance problems, prior Notices of Violation (NOVs), prior formal notifications from regulatory authorities, procedural deficiencies (e.g., recordkeeping) that could lead to real or perceived noncompliance, citizen complaints, increased potential for violations or complaints, lack of employee familiarity with relevant requirements, and changing conditions.

List Relevant Environmental Opportunities. Consider cost savings, cost avoidance, increased productivity (e.g., do more work with existing resources). Opportunities may also include current accomplishments that could provide a foundation for further improvements.

Rank/Prioritize the Issues and Opportunities (IOs). Consider resources needed, time required, magnitude of environmental benefit (may be viewed as "low hanging fruit"), relative acceptance/acknowledgement by public and regulators, ability to obtain employee "buy-in", and level of management interest and support. For organizations with multiple facilities or operations, prioritization could also consider the number of affected facilities and take advantage of economies of scale.

Identify DOT Activity Associated with Each Issue or Opportunity. Determine the specific DOT functions or facilities that would be involved in addressing an issue or opportunity. For example, a function could be materials handling and storage at stockpiles, storm water control during roadway maintenance, or the storm water management permit process for construction projects. Examples of DOT facilities include stockpiles, garages, rest areas, bridge tender houses, or weigh stations.

Select a Specific Focus for the EMS. Using the ranking information from above, briefly document the rationale for subsequent presentation to management.

2 | Identify Expected Environmental and Business Benefits

Determine Associated Environmental Benefits. Select benefits that can be measured or approximated, including: quantities or volumes, customer satisfaction score, improved regulatory relationships, and number of violations or incidents prevented or avoided (based on recent history).

Identify Associated Business Benefits. Selected business benefits should also be measurable. Such benefits include: dollars saved, cost avoided, man-hours saved or available for other use as a result of avoiding incidents or violations, dollars and hours associated with reduced monitoring or regulatory oversight, time saved (and associated hours, dollars, and schedule advancement) as a result of improved regulatory relationships or an enhanced review process.

Identify In-place Systems, Measures, and Data. These would be used to track success in achieving the identified benefits. EMS implementation and acceptance can be greatly enhanced through the use of existing tracking and measurement systems/processes, and existing data and measures.

3 | Establish Objectives, Quantifiable Measures, Targets, and Associated Milestones

The following actions help in setting measures for assessing performance that, when followed and tracked, will ensure EMS success.

Identify Actions. These actions address the issues, opportunities, activity, operation, and facility from Step 1 and provide the means to realize the benefit(s) identified in Step 2. Please note:

- There may be near-term and future actions—consider a step-by-step approach.
- Keep the list of actions short—too many actions can lead to confusion, loss of focus, and an effort that is difficult to manage.
- Recognize that the EMS typically requires coordination with non-environmental personnel and activities.

Identify Objectives. These objectives provide a goal/focus for each action. For example, an action could be to train employees in actions to be taken to fulfill a regulatory requirement in the course of day-to-day activities; the objective could be to reduce incidents of notices of violation. Keep the list as short as practical.

Establish a Performance Measure(s) for Each Objective. The measures could be near-term as well as long-term. In the example noted in the preceding bullet, a near-term measure could be percent of work force trained, while the long-term measure would be number of incidents. For example, the measure(s) should address the real reason/benefit for an action.

Establish a Target(s) for Each Measure. The target(s) should be realistic and achievable, but should challenge an organization to improve. Realistic targets help to ensure success and, thus, build buy-in for future EMS efforts that may present a greater challenge. Referring to the example, the targets could be 95 percent of work force trained leading to zero incidents without a follow up to prevent recurrence.

Establish a Milestone(s) for Meeting Each Target. As with all aspects of performance measurement, the milestones should be realistic and consider the overall mission of the organization and competing demands.

Identify Responsible Party(ies). These individuals, referenced by title instead of name, would be responsible for taking the action and meeting the target(s).

4 | Prepare the EMS Business Case and Obtain Management Commitment

Prepare the EMS Business Case. The EMS Business Case summarizes the information prepared in Steps 1 through 3 and is used as a briefing for DOT senior management to obtain their commitment to move forward with EMS development and implementation. An EMS Business Case contains the following key elements.

- **Resources.** Estimate the resources (personnel, financial, contractors, etc.) needed to implement the actions and meet the targets. If the resource needs span two or more planning/business cycles, estimate the relative splits (percent of total or estimate for each cycle).
- **Benefits.** Using the information developed in Steps 2 and 3, summarize the expected benefits and when they would be realized.
- **Responsibilities.** Identify the position who will manage the EMS effort and the positions that will play key roles (e.g., those responsible for an objective and target).
- **EMS Champion.** Identify the senior management position who will serve as the leader (i.e., management "champion"). This leader would ensure that: resources are available when needed, units outside of the EMS manager's area coordinate with and support the EMS effort, and employees throughout the organization recognize the commitment of senior management to the effort.

Obtain Approval and Commitment. The EMS Business Case is presented to DOT senior management to: solicit comment on determinations and recommendations in the Business Case; respond to any questions; and obtain their commitment and approval to proceed—including authorization of resources. Senior management receiving the Business Case would be an existing group or committee whose responsibility is to set DOT strategic direction.

Please note: Management direction and commitment is critical to the success of EMS development and implementation efforts. If DOT management provided the initial directive to pursue EMS development, this Approval step may not be as structured and detailed as shown or described. However, it is recommended that Steps 1 through 4 be followed to provide the focus and structure for an EMS and to help ensure EMS effectiveness and success.

Elements of management review and commitment include:

- **Review and Comment.**
  - Issues,
  - Opportunities,
  - Objectives,
  - Targets,
  - Goals,
  - Focus,
  - Resource requirements,
  - Schedule,
  - Expected results, and
  - Designated management "champion."
- **Clear, Public Commitment.** Management provides a statement of its commitment to the EMS and planned efforts.
- **Publicity.** Publicize management's stated commitment to EMS to all potentially involved employees. Consider the possibility of and schedule for announcing initial commitment to the public.

5 | Identify Existing Programs, Processes, Procedures, and Tools Relevant to the EMS

Build on What is In Place. As noted in the Background Briefing section of this Handbook, one of the Keys to Success is to use existing practices and information to the fullest extent practical to meet performance expectations and fulfill requirements of the specific focus area for the EMS. Existing practices and information may include non-environmental quality and other performance continual improvement efforts of the DOT. Efforts to integrate EMS processes, procedures, and tools into day-to-day activities are rewarded with long-term acceptance and ownership. Any perception that an EMS is a stand-alone program or simply another project diminishes EMS effectiveness.

In performing this Step, the EMS Team may consider current or near-term:

- **Initiatives.** Ongoing initiatives could be used or adapted for use in the EMS to fulfill the selected actions and meet the targets. Initiatives would be strategic in nature (e.g., plans to improve environmental performance).
- **Programs.** Existing programs could be department- or unit-wide directives (e.g., activities to fulfill an initiative).
- **Processes.** These include activities to fulfill programs or procedures (e.g., training courses).
- **Procedures.** Current step-by-step instructions can be modified to include environmental actions and objectives.
- **Tools.** These mechanisms can be used to support programs, procedures, and processes (e.g., checklists, computer databases, or performance "scorecards.")

6 | Identify Modifications Needed to Achieve EMS Objectives

Identify Gaps/Needs and Solutions. This Step provides the means to move the DOT to "what should be used" for processes, procedures, and tools. EMS Team actions include:

- **Determine the Optimum.** Identify the processes, procedures, and tools that could best meet EMS expectations and fulfill EMS requirements. Best practices information from other DOTs and DOT peer exchanges would facilitate this effort. In developing the optimum consider the following:
  - Issues and opportunities of the EMS focus selected in Step 1,
  - Environmental and business benefits identified in Step 2,
  - Actions, objectives, and targets established in Step 3,
  - Meet the commitments and expectations of management determined in Step 4, and
  - EMS attributes—consistency, repeatability, adaptability and flexibility (to accommodate various situations), integrated with existing actions, and easily understood by the user.
- **Compare.** Evaluate existing practices versus the optimum and identify gaps that would need to be filled to meet the optimum. There may be instances in which a gap cannot be met due to funding, technical, or other DOT constraints. In this situation, record this analysis so that it may be reconsidered in the future in the event constraints change, and define an optimum that meets EMS expectations but whose resulting gap can be addressed within existing constraints.
- **Identify Solutions.** Determine the actions that would be taken to fill the identified gaps in processes, procedures, and tools. Also, determine the time needed to develop new or modified processes, procedures, and tools for these actions.

7 | Assign Responsibility and Develop Enhanced or New Processes, Procedures, and Tools

Assign and Develop. The EMS Team assigns an individual or work group to develop or modify the processes, procedures, and tools identified through Step 6 (i.e., the solutions to fill gaps and needs). Specific actions and considerations include:

- **Identify a Leader.** The leader will coordinate group activities and maintain the group's focus on "results."
- **Keep it Small.** The group should be small enough to be manageable and meet routinely, and include representatives from those units affected by the EMS.
- **Identify Deliverables.** Set clear, agreed upon time tables for group efforts and submittal of work products.
- **Assess Progress.** The EMS Team monitors the group's performance to ensure that processes, procedures, and tools are provided when expected and that, if needed, delivery constraints are addressed.
- **Include Affected Parties.** To foster "ownership" and ensure the effectiveness and usefulness of the developed processes, procedures, and tools the group should represent all levels and units affected by the EMS.
- **Respond to Progress and Feedback.** EMS processes, procedures, and tools also establish the means to:
  - Monitor compliance,
  - Evaluate performance versus targets,
  - Assign and implement corrective actions (to address the condition at hand), and
  - Identify and implement preventive actions (to prevent a condition from recurring).

Additional Tips

To enhance consistency, communication, and repeatability develop an **EMS document or manual** that contains or provides easily accessible links to the DOT's EMS processes, procedures, and tools.

Various firms and organizations have developed **EMS software tools.** These tools, which may be proprietary or non-proprietary, range from simple document capture applications to detailed checklists (including criteria) to maintain and review the various elements of an EMS.

8 | Identify Affected Personnel and Implement Processes, Procedures, and Tools

Identify Personnel. In conjunction with the efforts described in Step 7, the group developing the processes, procedures, and tools would identify the personnel (i.e., internal stakeholders) responsible for EMS implementation. To ensure ongoing applicability, personnel should be *identified by position/title* as opposed to name. *Please note,* external stakeholders who would be informed of or be affected by EMS implementation (e.g., regulators or citizens near a DOT job site or facility) should also be identified. As the EMS is implemented DOT personnel with defined EMS communication or coordination responsibilities would fulfill their EMS responsibilities.

Define Responsibilities. The group would then identify within the processes, procedures, and (as applicable) tools the positions/titles responsible for following/implementing the actions required.

Communicate Details. Completion of the processes, procedures, and tools requires that the group identify the most effective and efficient means (including repeat announcements) to communicate requirements to the personnel responsible for following/implementing the requirements. The requirements are then communicated using the identified methods. *Communication methods and frequency may vary by position.*

Implement. As the details of the processes, procedures, and tools are communicated the EMS Team and group, and personnel with EMS-related managerial or supervisory responsibilities take the day-to-day actions to ensure that the processes, procedures, and tools are implemented. These actions include oversight, reminders, and setting an example.

9 | Develop the EMS Training Program and Conduct the Training

Train All Affected Personnel. Performance and compliance is optimized by training personnel affected by an EMS on the use of and their responsibilities in EMS processes, procedures, and tools. An EMS training program is not a simple "once and done" effort—it would be *ongoing, consistent, and tailored to the roles and responsibilities* of the affected personnel. Key actions to develop and implement an EMS training program include:

- **Determine Training Type and Content.** Training materials and format would reflect the best possibility achieve implementation of the EMS procedures, processes, and tools. Consider the intended audience (different types and content may be needed).
- **Identify Personnel to be Trained.** Building upon training type and content, and consideration of the audience—determine the job titles for those to be trained.
- **Define Training Schedule and Frequency.** Repeating the EMS "message" provides a means to make EMS an automatic part of day-to-day activities—as DOTs have done and continue to pursue with workplace safety programs. Schedule and frequency should also recognize that frequent, brief training sessions (including refresher training) tied into current activities (e.g., shop floor meeting or job site reviews) may be more effective than infrequent, longer sessions.
- **Identify Existing Materials and/or Programs.** Existing training could be adapted for EMS use or to which EMS content could be added.
- **Identify Presenter(s).** Select presenters who have experience in the subject area, relationships with and respect of the parties to be trained, and communication skills.
- **Develop the Training Materials.** This could be performed by: the EMS Team, a subgroup of the Team, or others identified by the EMS Manager and Team.
- **Present the Training.** Once developed, provide the training to the intended recipients and in accordance with the established schedule. Presentation also includes the use of attendance rosters and similar records to ensure that all personnel with EMS roles and responsibilities are current with their training as scheduled and programmed.
- **Document the Training.** Maintain records of the personnel who have been trained and review these records periodically to ensure that training needs and requirements have been fulfilled.

- **Assess Training Effectiveness.** As an outcome of performance assessment in the following Roadmap step, determine if the EMS training is successful in providing the knowledge and skills needed to fulfill environmental objectives. This can be accomplished through the application of "root cause" analyses performed as part of Step 10. A performance shortfall could be attributed to shortcomings in training content and/or frequency. Following this assessment, continue or adjust the training program as needed.

10A and B | Assess EMS Performance (Ongoing and Strategic)

The "Check" of Plan–Do–Check–Act. Several senior officials from DOTs have commented that their departments are great at Plan and Do, but fall short on Check. A key to making an EMS work is to evaluate performance in meeting EMS expectations, including conformance to EMS procedures. These evaluations may include regulatory compliance monitoring efforts if included within the EMS focus. EMS evaluations can be performed from two distinct perspectives as follows:

- **Ongoing Reviews.** These reviews would be conducted frequently (e.g., bi-weekly, monthly, or quarterly) by managers and staff who are most directly involved in EMS oversight and implementation. A focus would be on assessing performance and identifying actions to ensure that overall and longer-term (e.g., annual) EMS compliance requirements and performance are fulfilled.
- **Strategic Reviews.** These assessments would be conducted with senior management periodically (e.g., semi-annually or annually). These reviews focus on evaluating the DOT's and its primary functional unit's (e.g., bureau) overall EMS performance.

EMS Assessment Program. Key actions to develop and elements of EMS performance assessment processes, procedures, and tools include:

- **Assessment Criteria and Schedule.** Developed by the EMS Manager and EMS Team identify criteria to assess EMS progress and performance on an ongoing basis. Refer to: the actions, objectives, and targets from Step 3; the benefits identified in Step 2; and the management commitments and expectations identified in Step 4.
- **Progress Report.** Prepared for senior management using content requirements identified by the EMS Manager and Team. Content focuses on overall performance assessment for the Strategic Review. Include the following analyses in this report:
  - Characterize lessons learned and successes.
  - Identify opportunities for improving upon or expanding EMS efforts within or beyond the current organizational unit (refer to Steps 1 through 3).
- **Issues and Solutions.** Identify problems that may occur during EMS development and implementation and the means by which they could be overcome (either as they occur or before they occur). Include these solutions in the progress report. Also, identify actions that may require management comment or action.
- **EMS Maintenance.** The implementation of processes, procedures, and tools for continued EMS performance reviews and subsequent actions to improve or to address issues ensure that there is no "let up" in the progress achieved.

11 | Review Progress, Identify Adjustments, and Confirm Commitments

The "Act" of Plan–Do–Check–Act. The "Act" Step provides the means for *DOT management to act* upon the EMS performance assessment information resulting from the processes, procedures, and tools implemented through Step 10. This Step is crucial to maintaining EMS progress and commitment, and to continually improving a DOT's environmental and business performance. Key determinations that result from this "Act" step are:

- **Maintain.** The EMS is performing as intended—continue current levels of performance.
- **Modify.** Elements of or units affected by the EMS are not performing as expected—adjust expectations, or identify and implement modifications to meet expectations and targets.
- **Improve.** The EMS and affected units are meeting expectations and targets—establish more aggressive expectations and targets.
- **Expand.** The EMS and affected units are meeting expectations and targets—enlarge or add to the EMS focus area.

EMS "Act" Program. Key actions to develop and elements of EMS progress review and adjustment processes, procedures, and tools include:

- **Evaluate.** Following processes, procedures, and tools developed by the EMS Team, the EMS Manager submits a progress report to senior management. The report reviews progress and identifies any problems and suggested corrections.
- **Review and Decide on Next Steps.** DOT Management reviews the report and, if necessary, requests clarification. Following the review, management reaches a decision regarding next steps for the EMS—*Maintain, Modify, Improve, or Enlarge.*
- **Assign Resources and Responsibility.** As part of the decision, management reconfirms the commitment of resources, adjusts resources if needed, and assigns responsibility for implementing their decision.
- **Provide Commitment.** As part of any decision, management provides confirmation of their continued commitment to the EMS to employees.

REFERENCES

The AASHTO Center for Environmental Excellence's Technical Experts are available to provide strategic environmental and focused environmental management technical advice. For more information on the Center's Technical Assistance Program (CTAP) please visit: http://www.environment.transportation.org/center/tech_experts.

Additional information, documents, and resources of particular value to DOTs considering or in the process of using an EMS are available on the AASHTO Center for Environmental Excellence website: http://environment.transportation.org.

Appendix A

Construction Example

Following is an example that demonstrates application of the EMS Roadmap Steps to construction activities.

1 | Identify, Characterize Environmental Issue(s) and Opportunity(ies) and Select EMS Focus

- **Issues, in Relative Order.** 1) Recent incidents of sediment deposition or erosion (e.g., washouts) that required corrective actions in response to regulatory notification or stakeholder complaints; 2) Contractor activities leave conditions which could lead to erosion or sedimentation problems; and 3) Construction Inspectors have commented that their training and their measurement of success is on the delivery of a quality transportation facility (e.g., highway or bridge).
- **Opportunities, in Relative Order.** 1) Avoiding fines and project delays that, while they may be the responsibility of the contractor, reflect poorly on the DOT's planning, design, and maintenance activities; and 2) Construction Inspectors that are called to address and ensure correction of an environmental issue are drawn away from oversight and inspection activities that would ensure a quality transportation facility.
- **Factors in Prioritizing Actions.** 1) Inspectors are generally unfamiliar with specific erosion and sedimentation (E&S) control commitments and requirements; and 2) Inspectors did not have any readily available checklist of requirements or procedure for E&S control assessments.
- **Associated DOT Functions or Facilities.** Potential functions related to the prioritization factors include recognition of E&S control requirements and consequences, enforcement of E&S requirements on contractors, monitoring mechanisms to ensure compliance, and actions to correct and prevent non-compliant conditions.
- **Focus.** Selection addresses the prioritization factors noted above, the need to select a constrained focus, and the interest in providing demonstrated performance improvement in a relatively shorter time frame. For these reasons, the focus of the EMS will be on establishing EMS processes, procedures, and tools to ensure and verify that erosion and sedimentation is controlled during construction activities.

2 | Identify Expected Environmental and Business Benefits

Benefits.

- Reduce/Eliminate contractor fines, which, in turn, have a negative impact on perception of the DOT. Contractors have received an average of 25 fines or other notifications of E&S control noncompliance over the last three years across the state—these notifications typically have begun with calls to the DOT.
- Reduce DOT personnel time needed to address the fines. Each of these fines/notifications typically requires three and a half to four days of inspector time to respond to the complaint, notify the contractor, oversee contractor identification and implementation of corrective actions, prepare contract notice documents and records, and close out the corrective actions.
- Give DOT preliminary engineering staff information to improve the image of the DOT and improve public and regulatory responses to the DOT.

In-Place Systems, Measures.

- Notices of Violation records, formal communications from regulators, DOT labor records for projects, contractor cost tracking records, and/or records of public complaints or comments.

3 | Establish Objectives, Quantifiable Measures, Targets, and Associated Milestones

- **Actions.** 1) Develop simple, easily understood E&S commitments and requirements summary for use by Construction Inspectors; 2) Prepare E&S control assessment checklist that Construction Inspectors could use as a daily check on contractor compliance; 3) Develop process to report (to contractor and DOT management) on contractor E&S control performance; and 4) Develop and present training to ensure that Inspectors understand and ensure that contractors follow E&S control commitments and requirements. The information provided in the next three bullets refers (by number) to these actions.
- **Objectives.** 1) Provide E&S commitments and requirements summary to Inspectors; 2) Inspectors and Managers attend E&S training; 3) Assess contractor E&S control performance; and 4) Improve contractor compliance with E&S control commitments and requirements.
- **Measures.** 1) Percent of Inspectors who have commitments and requirements summary; 2) Percent of Inspectors trained in E&S control requirements; 3) Contractor assessment "scores" (e.g., number of yays or nays, or summary of 1–4 ratings); and 4) Number of fines, Notices of Violation, or other notifications.
- **Targets and Milestones (Refer to the Measures).** 1) Ninety-five percent or more of the Inspectors who have received the summary of commitments (within nine months); 2) Greater than 90–95 percent (within one year); 3) Value equivalent to 75 percent or greater (within two years); and 4) Zero for incidents that could have been prevented or, if accidental, without corrective/preventive action follow up (within two years).
- **Responsibilities.** Environmental Manager to lead efforts, Department Construction Manager and selected District construction staff to support developmental and training efforts, Department and District Construction Managers to lead implementation efforts.

4 | Prepare the EMS Business Case and Obtain Management Commitment

A Business Case example follows.

Resources. Eight person weeks each of environmental and construction staff time to develop: requirements summary, assessment checklist and reporting process, training program, and planning process. Training (assuming 100 inspectors across the state and four hour program)—400 hours. *Please note:* Time frames for resource commitments are identified in Step 6.

Benefits.

- Incidents of contractor non-compliance (that still reflects on the DOT)—eliminate 25 incidents a year (an average based on recent history).
- Productivity gain (by eliminating inspector oversight and coordination of preventable corrective actions)—estimated 75 days of inspector time over a year.

Responsibilities. Environmental Manager will manage efforts. Responsibility for implementation thereafter shifts to Department and District Construction Managers.

Champion. Department Construction Manager is expected to serve as "champion."

5 | Identify Existing Programs, Processes, Procedures, and Tools Relevant to the EMS

Examples of existing information follow.

- Construction Inspectors already have procedures and processes to assess, ensure, and report on contractor conformance to requirements. E&S control could be incorporated with these procedures and processes.
- Construction Inspectors already attend regulatory scheduled training programs. E&S control would be incorporated within this program and, possibly, within certain training agendas.
- Employee Job Descriptions already identify work responsibilities. Add brief statements of environmental responsibilities (e.g., attend training, implement environmental procedures, and follow environmentally-related instructions).

6 | Identify Modifications Needed to Achieve EMS Objectives

Examples of optimum determinations and resulting actions follow (the determinations and actions build upon the information provided in Step 5). The actions are presented in relative order of sequence.

Action 1. Review existing construction inspection procedures and processes to identify E&S control instructions/procedures (within six weeks).

Action 2. Develop E&S control commitments/requirements summary that will provide the basis for subsequent actions (within six weeks—concurrent with Item 1).

Action 3. Develop contractor E&S control assessment checklist and performance reporting process (within first three months—subsequent to Items 1 and 2).

Action 4. Integrate contractor performance reporting process into existing reporting mechanisms (within first six months).

Action 5. Provide training to Inspectors on E&S controls, the importance of contractor conformance with these requirements within all activities of the DOT, the use of the assessment checklist, making sure the contractors take *preventive* actions, and reporting on contractor E&S control performance (within nine to twelve months).

Action 6. Report on contractor E&S control performance (within first year).

7 | Assign Responsibility and Develop Enhanced or New Processes, Procedures, and Tools

*The **assignments** in the examples below refer to the action numbers used presented in Step 6 above.*

Action 1. Environmental Manager with Department and District Construction Unit staff.

Action 2. Environmental Manager with Department and District Construction Unit staff.

Action 3. Environmental Manager with Department and District Construction Unit staff.

Action 4. Department Construction Unit Manager coordinating with Procurement Unit Manager. Support from environmental, construction, and procurement staff.

Action 5. Environmental Manager with Department and District Construction Unit staff.

Action 6. Department Construction Unit Manager with support from District Construction Managers and Department environmental staff.

8 | Identify Affected Personnel and Implement Processes, Procedures, and Tools

*The following are examples of **affected personnel and associated responsibilities**.*

- Construction Inspectors and their managers attend training and implement procedures, processes, and tools (e.g., checklists and preventive action development).
- Department and District Construction Managers report on contractor E&S control performance.
- Environmental Manager, Department Construction Unit Manager, and environmental staff present and update, as necessary, training.

9 | Develop the EMS Training Program and Conduct the Training

See preceding steps—training was identified as an action to directly address needs and issues.

10A and B | Assess EMS Performance (Ongoing and Strategic)

Examples of ongoing and strategic assessment activities follow.

Use assessment performance results; and track incidents requiring corrective action and the DOT resources required to coordinate, oversee, and respond to the corrective actions.

- District Construction Managers provides Department Construction Unit Manager with quarterly reports on assessment results, number of incidents, and corrective actions.
- Department Construction Unit Manager reviews (on a quarterly basis) E&S control performance with Department Environmental Manager and District Construction Unit Managers to identify and implement opportunities for improvement in E&S control processes, instructions, tools, or training. Also identify and implement preventive actions that would minimize or eliminate the potential for future incidents.
- Department Construction Unit Manager summarizes performance status (on a quarterly basis) for presentation/review by Senior Management and presentation to public.

11 | Review Progress, Identify Adjustments, and Confirm Commitments

Examples of review, adjustment, and confirmation activities follow.

- Senior Management review performance summary presented by Department Construction Unit Manager.
- Senior Management identifies adjustments or enhancements, if needed.
- Senior Management authorizes additional or continued resources, as needed, to maintain or enhance EMS efforts.
- Senior Management authorizes release of performance information to the public.

ADDITIONAL RESOURCES

PRACTITIONER'S HANDBOOKS AVAILABLE FROM THE CENTER FOR ENVIRONMENTAL EXCELLENCE BY AASHTO:

01 Maintaining a Project File and Preparing an Administrative Record for a NEPA Study
02 Responding to Comments on an Environmental Impact Statement
03 Managing the NEPA Process for Toll Lanes and Toll Roads
04 Tracking Compliance with Environmental Commitments/Use of Environmental Monitors
05 Utilizing Community Advisory Committees for NEPA Studies
06 Consulting Under Section 106 of the National Historic Preservation Act
07 Defining the Purpose and Need and Determining the Range of Alternatives for Transportation Projects
08 Developing and Implementing an Environmental Management System in a State Department of Transportation

For additional Practitioner's Handbooks, please visit the Center for Environmental Excellence by AASHTO web site at: **http://environment.transportation.org**

Comments on the Practitioner's Handbooks may be submitted to:
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