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## **Task 3—Phase II Work Plan**

*NCHRP Project 14-40*

### **Comparison of Cost, Safety, and Environmental Benefits of Routine Mowing and Managed Succession of Roadside Vegetation**

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# **NCHRP 14-40: Comparison of Cost, Safety, and Environmental Benefits of Routine Mowing and Managed Succession of Roadside Vegetation**

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## **Introduction**

This document contains the draft Phase II Amplified Work Plan (AWP) for NCHRP 14-40 Comparison of Cost, Safety, and Environmental Benefits of Routine Mowing and Managed Succession of Roadside Vegetation. The research team will continue to incorporate literature, follow-up interviews and survey information as it becomes available. A few DOTs indicated current research projects underway and guidelines in development that will be made available before the termination of this research project.

## **Research Objective**

The objective of NCHRP 14-40 is provide guidance for roadside vegetation management that identifies and quantifies the cost, safety, and environmental impacts of routine mowing compared with managed succession of vegetation for areas outside the safety clear zone. Managed succession is based on a strategic approach of selective control measures that utilize a combination of zero maintenance, targeted mowing, mechanical trimming and removal, and chemical and/or biological treatments. The final product should be applicable to practitioners at all levels of experience with roadside vegetation management and be used to support informed decision-making.

## **Deliverables**

Table 1 lists the project deliverables.

**Table 1. Deliverables.**

<b>Task</b>	<b>Deliverable</b>	<b>Month</b>	<b>Status/Date</b>
—	Amplified Work Plan	1	Complete
3	Interim Report	10	Complete
	Annotated Outline of Guidelines		Complete
	Phase II Work Plan		Complete
4	Draft Guidelines	21	
5	Draft Interactive Tool	21	
6	Draft Final Report and Guidebook	24	
	Revised Final Deliverables		
	PowerPoint Presentation		

## **Phase II Work Plan**

The Project Team will refine the Phase II Work Plan based on feedback from the panel received either via written comments or during the panel meeting.

#### ***Task 4. Develop Guidelines***

##### **Objective**

The objective of this task is to develop comprehensive Guidelines to assist DOTs, engineers, landscape architects, vegetation managers, and other personnel tasked with managing roadside vegetation. The Guidelines will reflect panel comments of the interim report.

##### **Approach**

While Tasks 1 and 2 focused on gathering the available information and compiling the interim report, the TTI team understands that there might still be unresolved issues that need further research. Responses from the survey of practice demonstrated the need for and acceptance of guidance for implementation of reduced mowing and the associated issues to better enable DOTs to respond to public inquiries and institutional obstacles.

The Guidelines should reflect a system perspective where the anticipated use by various user groups for the corridor is considered. It is a goal of the research team to make the guidelines user friendly and application oriented. Guidelines will be developed for both the reconstruction and new construction situations and will address the subject areas listed in the project objectives. The Guidelines will also consider and discuss other possible impacts such as work zone traffic control, and wildlife collisions.

#### ***Task 5. Develop Interactive Tool***

##### **Objective**

The objective of Task 5 is to develop an Interactive Tool using common scenarios associated with routine mowing and managed succession of roadside vegetation. This practical and user-friendly document will provide recommendations to transportation and environmental agencies regarding the cost/benefits of reduced roadside maintenance operations.

##### **Approach**

This study should build on existing best practices and ensure maximum flexibility and usefulness. The Interactive Tool development should consider the following at a minimum:

- The existence of comparable practices and equivalent developments in other areas, like highway safety and operation project analysis. Examples of tools to be considered include, as a minimum:
  - FHWA desktop tools like FHWA-TOPS (Source: <http://www.ops.fhwa.dot.gov/>) which provides supporting guidance for operations.
  - FHWA web-based BCA.Net tool.
  - NCHRP 03-110 *Estimating the Life-Cycle Cost of Intersection Designs*.
- In the benefit cost analysis (BCA) in HSIP efforts, several values are used for crash costs, and the tool needs to provide the opportunity for the user to select a customized set of crash costs (shown in Figure 3. HSIP BCA Worksheet by Minnesota DOT-Office of Safety Analysis.). The proposed interactive tool will be based on some baseline scenarios associated with routine mowing and managed succession of roadside vegetation. The tool will provide user-friendly guideline to assign and weight values of different components like direct labor, equipment, materials, and management/planning costs so that tool users

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can make appropriate decision while comparing routine mowing with managed succession. The tool will consider maintenance of regional ecosystem and safety thresholds as priority.

- Default values of certain measures would be determined by considering baseline conditions for specific scenarios. A few sets of default values based on different baseline conditions would be measured. Determination of default values would require careful justification. The Research Team anticipates that default value measurement would require consideration of management practices, state-to-state variation, agency procedures, adjacent land uses, and physical condition of the vegetation.

<b>HSIP worksheet</b>			Control Section	T.H. / Roadway	Location	Beginning Ref. Pt.	Ending Ref. Pt.	State, County, City or Township	Study Period Begins	Study Period Ends		
				I-494	Portland Ave to Nicollet Ave	3+00.848	4+00.357	Hennepin Co.	1/1/2012	12/31/2014		
<b>Accident Diagram</b>			Codes	1 Rear End	2 Sideswipe Same Direction	3 Left Turn Main Line	5 Right Angle	4,7 Ran off Road	8, 9 Head On/ Sideswipe - Opposite Direction	Pedestrian	Other	Total
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 10px;">Study Period: Number of Crashes</div> <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: 0.8em; margin-right: 5px;">Personal Injury (PI)</div> <div style="border: 1px solid black; padding: 2px;">A</div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">B</div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">C</div> </div> <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: 0.8em; margin-right: 5px;">Property Damage</div> <div style="border: 1px solid black; padding: 2px;">PD</div> </div> </div>												
Year (Safety Improvement Construction)				2018								
Project Cost (exclude Right of Way)				\$ 600,000		Type of Crash	Study Period: Change in Crashes	Annual Change in Crashes	Cost per Crash	Annual Benefit	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <b>B/C= 1.66</b> </div> <div>             Using present worth values,  <b>B= \$ 998,370</b>  <b>C= \$ 600,000</b> </div> <div style="font-size: 0.8em;">             See "Calculations" sheet for              amortization.           </div>	
Right of Way Costs (optional)						F			\$ 1,140,000			
Traffic Growth Factor				0.5%		A			\$ 570,000			
Capital Recovery						B			\$ 170,000			
1. Discount Rate				2%		C	-1.25	-0.42	\$ 83,000	\$ 34,583		
2. Project Service Life (n)				30		PD	-2.50	-0.83	\$ 7,600	\$ 6,333		
						Total		\$ 40,917		Office of Traffic, Safety and Technology August 2015		

**Figure 1. HSIP BCA Worksheet by Minnesota DOT-Office of Safety Analysis.**

- The need to address additional elements that are specific to this comparison BCS tool including the following examples:
  - Provision of standard methods for quantifying different benefit metrics, associated data requirements, and methods to monetize them using simple and transferable methods.
  - Methods for addressing variability in input data using a variety of approaches including sensitivity and probabilistic simulation based methods, if needed.
  - Integration of BCA with other processes and constraints for overall prioritization of projects for allocating right investments.
- Non-monetary items are difficult to price like the monetary items. The focus of the interactive tool is to provide an atmosphere for comparing managed succession with routine mowing. The interactive tool would incorporate non-monetary values in the following two ways:

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- Use Multi-Criteria Analysis (MCA) to compare monetary factors with non-monetary factors. The following two methods would be adopted:
  - Impact Analysis: This method calculates the impact of non-monetary factors in an impact analysis format.
  - Scoring: This method provides numerical weights to non-monetary values in generating weighted score for all non-monetary items.
  - Provide tools in generating fact sheet like products with graphics in describing the non-monetary values.
- The technical and consistency elements that should be integrated in BCA procedures used by different programs or sectors include:
  - Quantification of benefit metrics,
  - Provision of defaults values for valuation,
  - Methods for local adjustments,
  - Safety outcomes, and
  - Maintenance of regional ecosystem.

The Project Team will develop an Excel®-based smart interactive tool or web-based interactive tool to assist analysts in application of the Guidelines developed in Task 4. To accommodate various input data needs, this tool will have inputs for required data elements and optional data elements. The Interactive Tool will be configured so the users can use default values for some inputs such as direct labor, equipment, materials, and management/planning costs, or provide values for these inputs if desired. The Interactive Tool will compute several measures of comparative cost-effectiveness, including benefit-cost ratio, and incremental benefit-cost ratio. The Project Team will prepare an instruction manual on the developed Interactive Tool.

### **Initial User Testing**

Once a draft version of the Interactive Tool is developed, the Project Team will distribute the draft Tool to practitioners as per needed by the NCHRP panel team. The Project Team will request the assistance of the NCHRP panel team to identify the appropriate practitioners for this distribution. The Project Team will then develop and present a webinar to demonstrate use of the draft Tool to the practitioners and request their feedback. The demonstration will include presentation of the examples and case studies included in the Guidelines to be developed in Task 4. Attendees will have opportunities to provide verbal feedback and ask questions about the use of the Tool.

To further facilitate the provision of informative feedback, the Project Team will develop a questionnaire with questions like the following:

- Is the Tool user friendly?
- Can you collect the required input data with a reasonable level of effort?
- Are the default values provided for some of the input variables plausible for your area?
- What are the most valuable calculations that the Tool provides to assist you in making a right comparison?
- What additional calculations or features should be added to the Tool?

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- What calculations or features should be removed or modified?

### ***Second User Testing***

The Project Team will review the feedback received from the initial round of user testing and revise the Interactive Tool accordingly. The Project Team will then conduct a second webinar to demonstrate the revised Interactive Tool to another group of interested practitioners. Ideally, this second group would include some attendees from the first webinar as well as some new attendees who had not previously used the Tool. The Project Team will solicit feedback on the revised Tool in the same manner as with the draft Tool, and then modify and finalize the Interactive Tool. After developing the final Tool, the Project Team will develop a User Guide for the Tool, to be included in the Guide developed in Task 4.

### ***Task 6. Prepare Final Deliverables***

#### **Objective**

The objective of this task is to prepare the final project documentation, which will include a final research report documenting the conduct of research, stand-alone Guidelines that includes an Interactive Tool.

#### **Approach**

Task 6 in this project is to prepare the final deliverables with a final report documenting the entire project's research efforts with a comprehensive description of the research activities, findings, results, and implementation recommendations. It will also include the following:

- Guidelines.
- Interactive Tool.
- Electronic presentation of the guidelines and interactive tool that can be tailored for specific audiences.

The final three months of the project will be dedicated to NCHRP review and comment (the first six weeks) and preparation of the revised final deliverables (the second six weeks).