

## APPENDIX A

### Survey Questionnaire

**NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM**  
**Project 20-5, Synthesis Topic 30-01**

**SYSTEMS ENGINEERING PROCESSES  
 FOR DEVELOPING TRAFFIC SIGNAL SYSTEMS**

**SUPPLEMENTAL QUESTIONNAIRE**

Name of primary respondent: \_\_\_\_\_  
 Title: \_\_\_\_\_  
 Agency: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Phone No.: \_\_\_\_\_  
 Fax No.: \_\_\_\_\_  
 E-mail: \_\_\_\_\_

Thank you for your response to the 1999 survey regarding NCHRP Project 20-5, Topic 30-01, *Systems Engineering Processes for Developing Traffic Signal Systems*. The survey results will be incorporated into a report providing a detailed nationwide summary of current practices concerning the processes, specifications, and equipment involved in the development, deployment, and maintenance of traffic signal systems.

The attached eight part questionnaire represents a supplement to the cited 1999 survey and seeks in-depth information and professional opinion regarding topics surrounding the engineering processes involved in the development, deployment, and maintenance of traffic signal systems. Part 1 of the questionnaire addresses current systems engineering processes employed in connection with major traffic signal systems. The next four questionnaire parts concern the planning, design, and/or engineering processes used in the specification of key traffic signal system components. Part 6 of the questionnaire pertains to system deployment and maintenance procedures. The final two survey parts ask respondents to evaluate various traffic control system concepts and identify improvements in the overall traffic signal system engineering process including the incorporation of a systems engineering approach.

Please return the completed questionnaire and any supporting documents via fax or mail to:

Steven P. Latoski  
 Dunn Engineering Associates  
 66 Main Street  
 Westhampton Beach, New York 11978 Tel (631) 288-2480 Fax (631) 288-2544

We would appreciate your response by **March 1, 2001**.

**THANK YOU FOR YOUR TIME AND EFFORT!!**

**PART 1 GENERAL**

Name of respondent: \_\_\_\_\_

Title: \_\_\_\_\_

Phone No.: \_\_\_\_\_

*Objective: Part 1 pertains to the overall systems engineering process.*

1. Does your organization use a formal process for the development of goals and objectives for major traffic signal system upgrades? **Yes** \_\_\_ **No** \_\_\_

1a. Describe the process used.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

1b. Please enclose any available documentation or provide a contact below for obtaining documentation.

\_\_\_\_\_  
\_\_\_\_\_

2. Prior to implementing system design, does your organization prepare a document defining the management approach to be used in implementing major system improvements? **Yes** \_\_\_ **No** \_\_\_

2a. Describe the document's scope.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2b. Please enclose any available documentation or provide a contact below for obtaining documentation.

\_\_\_\_\_  
\_\_\_\_\_

3. Does your organization use alternative evaluation methodologies (e.g., benefit vs. cost, utility vs. cost) in selecting approaches for major signal system upgrade projects? **Yes** \_\_\_ **No** \_\_\_

3a. Describe the methodology(s) used.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Does your organization use a methodology to select a systems procurement approach (low bid, two step process, design/build, system manager, etc.)? **Yes** \_\_\_ **No** \_\_\_

4a. Describe the methodology(s) used.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- 4b. Is your procurement approach determined by your organization’s procedures? **Yes** \_\_\_ **No** \_\_\_
- 5. Does your organization conduct a formal evaluation (e.g., before and after studies) in connection with major improvements? **Yes** \_\_\_ **No** \_\_\_

5a. Describe the evaluation methodology(s) used.

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**PART 2 CENTRAL TRAFFIC CONTROL EQUIPMENT AND FIELD MASTERS**

Name of respondent: \_\_\_\_\_

Title: \_\_\_\_\_

Phone No.: \_\_\_\_\_

*Objective: Part 2 pertains to the planning, design, and/or engineering processes used in the specification of central traffic control equipment and field masters.*

- 6. Does your organization use standard specifications to which central traffic control systems and field masters (if applicable) **must** conform? **Yes** \_\_\_ **No** \_\_\_
- 7. Does your organization use standard specifications to which central traffic control systems and field masters (if applicable) **may optionally** conform? **Yes** \_\_\_ **No** \_\_\_
- 8. If the answer to Question 6 or Question 7 is “yes,” how often are major revisions made to the specifications?

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8a. What drives the specification revision cycle?

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- 9. Does your organization adhere to a formal planning, design, or engineering process in the development of designs and specifications for the type of traffic system to be used (e.g., centrally controlled, closed loop, adaptive) for a particular application? **Yes** \_\_\_ **No** \_\_\_

9a. Describe the process used.

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9b. Please enclose any available documentation or provide a contact below for obtaining documentation.

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10. If the answer to Question 9 is “yes,” how successful has the formal process been?

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10a. What changes would you recommend to the formal process?

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11. Does your organization follow a formal process to determine how the system should be operated (e.g., hours of attended operation, operating mode, acceptable maintenance response time)? **Yes** \_\_\_ **No** \_\_\_

11a. If “yes,” describe the process used.

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11b. Please enclose any available documentation or provide a contact below for obtaining documentation.

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12. With the exception of standards related issues, has the National ITS Architecture significantly changed your organization’s systems engineering approach? **Yes** \_\_\_ **No** \_\_\_

12a. If “yes,” describe the changes attributed to the National ITS Architecture.

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**PART 3 COMMUNICATIONS TO THE FIELD**

Name of respondent: \_\_\_\_\_

Title: \_\_\_\_\_

Phone No.: \_\_\_\_\_

*Objective: Part 3 concerns the planning, design, and/or engineering processes used in the specification of a communications system to the field electronics equipment.*

13. Does your organization use standard specifications to which communications to the field electronics equipment (e.g., media selection, modems, communication standards, and protocols) **must** conform? **Yes** \_\_\_ **No** \_\_\_

14. Does your organization use standard specifications to which communications to the field electronics equipment (e.g., media selection, modems, communication standards, and protocols) **may optionally** conform? **Yes** \_\_\_ **No** \_\_\_

15. If the answer to Question 13 or Question 14 is “yes,” how often are major revisions made to the specifications?

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15a. What drives the specification revision cycle?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

16. Does your organization adhere to a formal planning, design, or engineering process in the development of designs and specifications for the type of communication system to be used? **Yes** \_\_\_ **No** \_\_\_

16a. If "yes," describe the process used.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

16b. Please enclose any available documentation or provide a contact below for obtaining documentation.

\_\_\_\_\_  
\_\_\_\_\_

17. If the answer to Question 16 is "yes," how successful has the formal process been?

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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

17a. What changes would you recommend to the formal process?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**PART 4 FIELD EQUIPMENT**

Name of respondent: \_\_\_\_\_

Title: \_\_\_\_\_

Phone No.: \_\_\_\_\_

*Objective: Part 4 concerns the planning, design, and/or engineering processes used in the specification of field equipment.*

18. Does your organization use standard specifications to which the field equipment (e.g., controllers, detectors, etc.) **must** conform? **Yes** \_\_\_ **No** \_\_\_

19. Does your organization use standard specifications to which the field equipment (e.g., controllers, detectors, etc.) **may optionally** conform? **Yes** \_\_\_ **No** \_\_\_

20. If the answer to Question 18 or Question 19 is "yes," how often are major revisions made to the specifications?

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20a. What drives the specification revision cycle?

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21. Does your organization follow a formal planning, design, or engineering process in the development of designs and specifications for the type of field equipment to be used? **Yes** \_\_\_ **No** \_\_\_

21a. If "yes," describe the process used.

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21b. Please enclose any available documentation or provide a contact below for obtaining documentation.

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22. If the answer to Question 21 is "yes," how successful has the formal process been?

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22a. What changes would you recommend to the formal process?

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**PART 5 ENGINEERING AND DESIGN OF INTERSECTION INSTALLATIONS**

Name of respondent: \_\_\_\_\_

Title: \_\_\_\_\_

Phone No.: \_\_\_\_\_

*Objective: Part 5 concerns the planning, design, and/or engineering processes used in the specification of traffic signal installations at intersections.*

23. Does your organization follow a formal planning, design, or engineering process in the determination of an engineering decision regarding whether an intersection requires a signal or if a signal should be removed?

**Yes** \_\_\_ **No** \_\_\_

23a. If "yes," describe the process used.

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23b. Please enclose any available documentation or provide a contact below for obtaining documentation.

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24. Does your organization follow a formal planning, design, or engineering process in the determination of an engineering decision regarding whether an isolated intersection should be actuated? **Yes** \_\_\_ **No** \_\_\_

24a. If “yes,” describe the process used.

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24b. Please enclose any available documentation or provide a contact below for obtaining documentation.

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25. Does your organization follow a formal planning, design, or engineering process in the determination of an engineering decision regarding whether coordination should be employed at an intersection?  
**Yes** \_\_\_ **No** \_\_\_

25a. If “yes,” describe the process used.

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25b. Please enclose any available documentation or provide a contact below for obtaining documentation.

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26. Does your organization follow a formal planning, design, or engineering process in the determination of an engineering decision regarding whether side street or turning phase actuation should be employed in coordinated systems? **Yes** \_\_\_ **No** \_\_\_

26a. If “yes,” describe the process used.

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26b. Please enclose any available documentation or provide a contact below for obtaining documentation.

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**PART 6 OPERATIONS AND LOGISTICS**

Name of respondent: \_\_\_\_\_

Title: \_\_\_\_\_

Phone No.: \_\_\_\_\_

*Objective: Part 6 pertains to traffic signal system deployment and maintenance procedures.*

27. Does your organization have procedures or standards for planning and specifying maintenance and/or training?  
**Yes** \_\_\_ **No** \_\_\_

27a. If "yes," please enclose any available documentation or provide a contact below for obtaining documentation.

\_\_\_\_\_

\_\_\_\_\_

28. Does your organization conduct an evaluation of traffic signal system performance when performing an upgrade?  
**Yes** \_\_\_ **No** \_\_\_

29. Does your organization conduct an evaluation of traffic signal system performance at periodic intervals?  
**Yes** \_\_\_ **No** \_\_\_

30. If the answer to Question 28 or Question 29 is "yes," how is the evaluation performed?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

30a. Please enclose any available documentation or provide a contact below for obtaining documentation.

\_\_\_\_\_

\_\_\_\_\_

**PART 7 IMPROVEMENT OF TRAFFIC SIGNAL SYSTEM ENGINEERING PROCESS**

Name of respondent: \_\_\_\_\_

Title: \_\_\_\_\_

Phone No.: \_\_\_\_\_

*Objective: Part 7 seeks to identify improvements in the overall traffic signal system engineering process.*

31. Does your organization perceive a need for a report or manual describing a formal system engineering process to address:

- a. Specification of central control equipment and field masters? **Yes** \_\_\_ **No** \_\_\_
- b. Specification of a communications systems to the field electronics equipment? **Yes** \_\_\_ **No** \_\_\_
- c. Specification of field equipment? **Yes** \_\_\_ **No** \_\_\_
- d. Specification of traffic signal installations at intersections? **Yes** \_\_\_ **No** \_\_\_
- e. Traffic signal system deployment and maintenance? **Yes** \_\_\_ **No** \_\_\_

32. Does your organization perceive a need for increased quality and/or quantity of tutorial material to facilitate the selection process for:

- a. Central control equipment and field masters? **Yes** \_\_\_ **No** \_\_\_
- b. Communications systems to the field electronics equipment? **Yes** \_\_\_ **No** \_\_\_
- c. Field equipment? **Yes** \_\_\_ **No** \_\_\_

- d. Traffic signal installations at intersections? Yes \_\_\_ No \_\_\_
- e. Traffic signal system deployment and maintenance? Yes \_\_\_ No \_\_\_

**PART 8 IMPORTANCE FACTORS**

Name of respondent: \_\_\_\_\_  
 Title: \_\_\_\_\_  
 Phone No.: \_\_\_\_\_

*Objective: Part 8 concerns the evaluation of various traffic control system development and deployment issues.*

33. On a scale of 1 (least important) to 10 (most important), rank the importance of the following in the development of traffic control system concepts, system specifications, equipment specifications, and intersection engineering designs:

| Issues  | Central System<br>and<br>Field Masters | Communications | Field<br>Equipment |
|---|--|----------------|--------------------|
| a. Legacy issues (compatibility with existing systems, equipment).                                |  |                |                    |
| b. Ease, cost, and availability of maintenance and support.                                       |  |                |                    |
| c. Performance (real-time traffic flow optimization).   |  |                |                    |
| d. Familiarity with technology.   |  |                |                    |
| e. System cost.   |  |                |                    |
| f. National Architecture conformance.   |  |                |                    |
| g. Compatibility with other ITS in <b>your</b> organization's jurisdiction.                       |  |                |                    |
| h. Compatibility with ITS in <b>other</b> jurisdictions.  |  |                |                    |
| i. Availability of new national specifications (NEMA, NTCIP, ATC, etc.).                          |  |                |                    |
| j. Availability of new system coordination technology (e.g., SCOOT, SCATS, RTRACS, OPAC, RHODES). |  |                |                    |
| k. Plan for introducing the NTCIP protocol for communication to intersection signal controllers.  |  |                |                    |
| l. Perceived future needs.  |  |                |                    |
| m. Other _____<br>_____   |  |                |                    |
| n. Other _____<br>_____   |  |                |                    |

33a. If one or more traffic control components are checked under issue "I," please identify the specifications important to your organization.

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34. Please list a contact person for obtaining additional information.

|                        |             |
|------------------------|-------------|
| <b>Contact person:</b> | <b>Name</b> |
|                        | <hr/>       |
| <b>Title</b>           | <hr/>       |
| <b>Agency</b>          | <hr/>       |
| <b>Address</b>         | <hr/>       |
| <b>Phone</b>           | <hr/>       |
| <b>Fax</b>             | <hr/>       |
| <b>E-mail</b>          | <hr/>       |

Please send any documents detailing processes for developing, deploying, and maintaining traffic signal systems along with the completed questionnaire to:

**Steven P. Latoski**  
**Dunn Engineering Associates**  
**66 Main Street**  
**Westhampton Beach, New York 11978**  
**Fax (631) 288-2544**

End of Survey. **THANK YOU!**