



MEMORANDUM

To: Regional Transportation Operations Coalition
From: Tom Murtha
Date: March 10, 2015
Re: Regional Traffic Signal Inventory – Options

In 2013, members of the Regional Transportation Operations Coalition (RTOC) suggested that CMAP pursue improvements to the regional traffic signal inventory for the seven-county Chicago region. While agencies throughout the region have long maintained their own inventories, consistent and uniform information about signals across jurisdictions is lacking. Some inventories also lack a GIS component. This complicates data sharing across agencies. The Regional Traffic Signal Inventory (RTSI) seeks to fill this gap and to facilitate inter-jurisdictional communication and more effective transportation studies.

CMAP is now considering the development of the RTSI for FY 2016 and 2017. Discussions need to take place regarding agency support among RTOC agencies. In addition, resources for development and maintenance of the database need to be addressed.

RTSI is not intended to replace current inventories maintained by individual agencies. Rather, it is meant to supplement and build upon data that is already collected. In reviewing the state of current signal inventories throughout the region, it became clear that most data already collected is primarily geared toward facilitating *maintenance* of the system. These inventories will continue to serve this function. RTSI, on the other hand, should consist of data that is primarily geared toward facilitating more informed *policy* decisions.

CMAP staff is considering opportunities to address highway operations needs through increased attention to arterial highway operations, particularly highway traffic signals. RTSI will also support potential CMAP signal policy and funding initiatives by addressing the following questions about regional signal systems:

- What is the age of traffic signal systems? Where are signals deployed? What types of signals are deployed? What basic and advanced signal technologies are deployed?
- Are the current deployments of highway traffic signal technologies appropriate for modern traffic control needs?
- Do deployments of highway traffic signal technologies support community livability and multimodal travel, where appropriate, and accessibility for people with disabilities?

With answers to these questions, CMAP may be able to address the following policy issues:

- Is maintenance of existing traffic signals sufficient, or should resources for this maintenance be ramped up?

- Should local and regional initiatives to deploy new signal technologies to reduce motorist delay and improve safety be included in an updated regional plan?
- Should local and regional initiatives to address multimodal and accessibility needs be included in an updated regional plan?

This memo outlines a proposed database structure and potential data fields to be included in RTSI, which have been selected based on previous discussions at RTOC meetings and CMAP's review of existing signal inventories. They are presented in three options. A final decision will need to involve consultations here at CMAP and with agencies participating in the Regional Transportation Operations Coalition.

Proposed Structure

Data will be housed in ArcGIS and have a simple format with sufficiently detailed information. For example, most fields are proposed to be constructed with a drop-down menu to increase uniformity and avoid data entry errors, and many simply require "yes-no" entries (e.g., those pertaining to various technology deployments). The phase-in of the model is expected to take several years, similar to the process used to develop the CMAP bikeways geodatabase in 2002.

It is proposed that the signal inventory be structured in a way similar to our Bikeway Inventory System, so that each jurisdiction with maintenance over traffic signals will be maintained as a single feature class within a file geodatabase. Each agency would be asked to maintain and develop their own signal databases in such a way as to be consistent with a template feature class.

In addition, unlike the Bikeway Inventory System, the medium- to long-term goal of this system will be to support a feature class (in addition to the agency feature classes) that will identify each highway traffic signal in the region, regardless of jurisdiction agency. It is anticipated that this regional feature class will be a master feature class with little attribute data; its function would be to point associated records in the jurisdiction feature classes. Thus, the previously time-consuming task of reconciling inconsistent data among various agencies reporting a signal within their databases would be obviated. It is understood from brief discussions with Craig Heither that a regional signal inventory would be helpful in the development of the CMAP dynamic traffic assignment system.

Proposed Data Fields

Option A

This option entails fields that were identified prior to review of individual agency inventories, based on initial discussion with RTOC members and other engaged parties. A rough version of this list was first presented to a group at Argonne National Laboratories in March 2013.

Coincidentally, about 50 percent of the proposed items in *Option A* turned out to be present in at least two other signal inventories reviewed by CMAP.

Table 1: Feature Class properties – Option A*(Note: Please consult Appendix for domain definitions)*

	Field Name	Data Type	Alias	NULL values	Domain	Length
1	OBJECTID	Object ID				
2	SHAPE	Geometry (Point)		Yes		
3	MAJORST	Text	Major Street	Yes		80
4	MAJOR_RTE	Text	Major Route Type	Yes	ROUTE	24
5	MAJOR_RTE_NUM	Double	Major Route Number	Yes		
6	MINORST	Text	Minor Street	Yes		80
7	MINOR_RTE	Text	Minor Route Type	Yes	ROUTE	24
8	MINOR_RTE_NUM	Double	Minor Route Number	Yes		
9	AGENCYID	Text	Agency ID	Yes		50
10	CMAPNODE	Double	CMAP Node	Yes		
11	XCOORD	Double	X-Coordinate	Yes		
12	YCOORD	Double	Y-Coordinate	Yes		
13	MAJORST_JURIS	Text	Major Street Highway Jurisdiction	Yes	JURIS	24
14	SIGMAINT_JURIS	Text	Signal Maintenance Jurisdiction	Yes	JURIS	24

15	RRCOORD	Text	Railroad Coordination	Yes	YESNO	3
16	MASTER	Text	Master Controller	Yes	YESNO	3
17	COMTYPE	Text	Coordination Communication Type	Yes	COMTYPE	24
18	CONTMANUF	Text	Controller Manufacturer	Yes		50
19	CONTMODEL	Text	Controller Model	Yes		50
20	CONTYPE	Text	Controller Type	Yes	CONTYPE	24
21	VEHDET	Text	Vehicle Detection Type	Yes	VEHDET	24
22	SIGIC	Text	Signal Interconnect	Yes	YESNO	3
23	SIGICID	Double	Signal Interconnect ID	Yes		
24	ADAPTSIG	Text	Adaptive Signal Control	Yes	YESNO	3
25	TSP	Text	Transit Signal Priority	Yes	YESNO	3
26	REDENF	Text	Red-Light Camera Enforcement	Yes	YESNO	3
27	PEDSIG	Text	Pedestrian Signal	Yes	YESNO	3

28	PEDCD	Text	Pedestrian Countdown Signal	Yes	YESNO	3
29	ACCPEDSIG	Text	Accessible Pedestrian Signal	Yes	YESNO	3
30	EMERGPEMP	Text	Emergency Vehicle Preemption	Yes	YESNO	3
31	DILEMZONE	Text	Dilemma Zone Protection	Yes	YESNO	3
32	INSTALLDATE	Date	Signal Installation Date	Yes		4
33	LASTMODDATE	Date	Most Recent Signal Modification Date	Yes		4

Option B

This list includes *Option A* AND data items that are common to IDOT and Lake County signal inventories—currently, the most extensive inventories in the region.

Table 2: Additional Feature Class Properties – Option B

	Field Name	Data Type	Alias	NULL values	Domain	Length
32	COUNTY	Text	County	Yes	CNTY	24
33	MUNI	Text	Municipality	Yes		50
34	CMU_MAKE	Text	Conflict Monitor Make	Yes		50

35	CMU_MODEL	Text	Conflict Monitor Model	Yes		50
36	UPS_MAKE	Text	Power Supply Make	Yes		50
37	UPS_MODEL	Text	Power Supply Model	Yes		50
38	FLASHER	Text	Flasher Type	Yes		24
39	SIGMAINT_PCT	Double	Percent Maintenance Responsibility	Yes		
40	ENERGY_PCT	Double	Percent Energy Responsibility	Yes		
41	PTZ_CAM_MAKE	Text	Camera Make	Yes		50
42	PTZ_CAM_MODEL	Text	Camera Model	Yes		50

Option C

This list includes *Option A*, *Option B*, AND all fields present in either the IDOT or Lake County signal inventories regardless of commonality. (Though every attempt was made to translate data fields from original inventory, some inconsistency may exist between this list and the original inventories due to differences in database structure.)

Table 3: Additional Feature Class Properties – Option C

	Field Name	Data Type	Alias	NULL values	Domain	Length
43	BIU_MAKE	Text	Bus Interface Unit Make	Yes		50
44	BIU_SOFTW	Text	Bus Interface Unit Software Version	Yes		50
45	MODEM_MAKE	Text	Modem Make	Yes		50
46	MODEM_MODEL	Text	Modem Model	Yes		50
47	MODEM_SP	Text	Modem Speed	Yes		50

48	DET_AMP_MAKE	Text	Detection Amp Make	Yes		50
49	DET_AMP_MODEL	Text	Detection Amp Model	Yes		50
50	DET_AMP_CH	Double	Detection Amp Total Channels	Yes		
51	DET_AMP_AVAIL	Double	Detection Amp Available Channels	Yes		
52	EVP_AMP_MAKE	Text	EVP Amp Make	Yes		50
53	EVP_AMP_MODEL	Text	EVP Amp Model	Yes		50
54	EVP_AMP_CH	Double	EVP Amp Total Channels	Yes		
55	EVP_AMP_AVAIL	Double	EVP Amp Available Channels	Yes		
56	HW_MAST_ARM	Text	Hardware Mast Arm	Yes		50
57	HW_MAST_TYPE	Text	Hardware Mast Arm Type	Yes		50
58	MAST_QTY	Double	Hardwar Mast Quantity	Yes		
59	MAST_PAINTED	Double	Hardware Mast Quantity Painted	Yes		
60	POST_PAINTED	Double	Hardware Post Quantity Painted	Yes		
61	ELEC_MNT	Text	Electrical Service Mount Type	Yes		50

62	ELEC_GND	Text	Electrical Service System Grounded	Yes	YESNO	3
63	POLICE	Text	Police Dept Nearest	Yes		50
64	HH_TYPE	Text	Handhole Type	Yes		50
65	HH_USAGE	Text	Handhole Usage	Yes		50
66	MAINT_REC	Date	Recent Maintenance	Yes		24
67	MAINT_CONT	Text	Maintenance Contractor	Yes		50
68	LED_SIGNS	Double	LED Street Signs	Yes		
69	SL_QTY	Double	Street Light Quantity	Yes		
70	SL_MAINT_PCT	Double	Percent St Light Maint Responsibility	Yes		
71	LYR_SWITCH	Text	Layer Switch	Yes		50
72	PORT1_DEV	Text	Port 1 Device	Yes		50
73	PORT2_DEV	Text	Port 2 Device	Yes		50
74	PORT3_DEV	Text	Port 3 Device	Yes		50

75	ITS_PHASE	Double	ITS Phase	Yes		
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Discussion

A final decision regarding the above options should be guided by the overarching goals of RTSI—which at this point might still be subject to further debate and ultimately determined by RTOC. Thus, the following questions must be discussed:

1. What *should* be the ultimate goal or vision of RTSI?
2. Which option presented in this memo would best fulfill this goal or vision?

Points to consider: *Option A* would seem to hold the most outside stakeholder interest, while *Option B* or *Option C*, perhaps, would better serve the interests of agencies that don’t currently have a robust database by providing them with a model structure. There are certainly other important aspects to consider, as well, but of utmost importance is RTOC’s full support of whichever decision is made.

Resources

Metadata for the existing highway traffic signal inventory shapefile is located here: <https://datahub.cmap.illinois.gov/dataset/b84236bb-416e-4e6b-a3ec-25f03f6d8897/resource/6f044a12-186c-46a9-8a8b-cd839416af7f/download/rtamssignalsp6revised201410.pdf>.

The structure and manual for the Bikeway Inventory System (BIS) is located here: <https://datahub.cmap.illinois.gov/dataset/d81a4c94-78f4-435a-8ace-28fd3fb1c782/resource/9197dcd3-1037-4214-a255-86ea3ccb6133/download/bismanual201409.pdf>.

Next Steps

This proposal will need to be considered by Research and Analysis staff here, whose advice and perhaps assistance will be sought. In addition, it will need to be brought to RTOC for consideration during at least two meetings, for discussion and approval of the template structure.

Acknowledgements

The initial research and outline for this memo was completed by Brett Barkley, a research intern, before our transition to the Performance Based Programming division.

APPENDIX

In order to create consistency among entries within the RTSI, certain data fields have a pull-down menu with which to populate fields. These pull-down menus will help eliminate spelling mistakes and provide a higher level of consistency for the classification of facilities. Domains included in the RTSI geodatabase and their values are as follows:

- CNTY – Cook, DuPage, Kane, Kendall, Lake, McHenry, Will
- COMTYPE – Closed Loop, Central Control
- CONTYPE – Pre-timed, Semi-actuated, Fully actuated, Volume-density control
- JURIS – CDOT, Cook County, DuPage County, IDOT, Kane County, Lake County, McHenry County, Will County, Other
- PEDSIG – None, Partial, Full
- ROUTE – US, IL, CTH
- VEHICDET – Loops, Infrared, Magnetometer, Microwave, Video
- YESNO – Yes, No