

## FY 18 MDOT SHA Research Needs

### Response to Administrative & Technical Questions

*Updated 06/19/17*

#### **Administrative Questions:**

**QuestionA1:** *Is there a budget limit for proposals?*

**Answer:** No. However, cost will be factor in the proposal selection process.

**QuestionA2:** *Will SHA select only one proposal for each research topic or multiple?*

**Answer:** In general SHA will only select one proposal for each research topic. However, in cases where it is deemed to be advantageous to SHA to pursue more than one proposed research plan, multiple selections may occur. That will not be determined until the proposal review phase and will also depend on funding availability.

**QuestionA3:** *Can a researcher submit multiple proposals for one research topic?*

**Answer:** No. Researchers may submit a proposal for more than one research topic but should not submit multiple proposals for the same topic.

**QuestionA4:** *How long is the study period for SHA research proposals?*

**Answer:** Unless otherwise specified in the RFP, the study period for the research is flexible and should be based on the scope-of-work proposed. However, a 12-18 month time frame is generally desirable.

**QuestionA5:** *Are there restrictions for font size and page margins?*

**Answer:** No, we did not set any restriction on font size or page margins. We accept proposals that communicate a straightforward and professional image.

**QuestionA6:** *Does the proposal need to be routed through the university's research administration office?*

**Answer:** When responding to a RFP, a proposal is not required to be routed through the research administration office. After being selected, the final proposal would have to be routed through the research administration office. PIs should always check with their individual universities for their specific policy.

**QuestionA7:** *Is an appendix allowed and will it count towards the page count?*

**Answer:** Yes and yes, an appendix is allowed and it will count towards the ten page limit.

**QuestionA8:** *I would like to get some information on 2018-01: 1. the budget amount and 2. the duration of this research.*

**Answer:** Please see our answers to QuestionA1 and QuestionA4.

## **Technical Questions:**

### **RFP#01: Special Event Impact Study at Maryland Casinos**

No questions to date.

### **RFP#02: Using Radio-Frequency Identification (RFID) for Asset Inventory**

No questions to date.

### **RFP#03: Balanced Mix Designs for More Durable Pavements in Maryland**

No questions to date.

### **RFP#04: Automated Route Optimization Planning for Maryland Condition Assessment System (GIS tool)**

**Question#1:** *How long does the current process take to plan out manually?*

**Answer:** The process of creating, updating, and scheduling the initial summer tours for inspection takes 2 people approximately 3 to 4 months every year (February to May).

Then in the fall a new set of tours is created to reassess the line striping failures captured during the summer months. This will take on average between 1 and 2 months (October and November).

**Question#2:** *How long does the actual condition assessment take to complete (i.e. man months), and how many crews do you have working on the assessment?*

**Answer:** Once the routing for the tours is complete (see question 1), the actual assessment of the roadways (completion of the tours) takes another 3 months (June to August).

For the summer tours we have a pool of 24 people to choose from to create a 4-person team for each tour. There are 21 summer tours needing completion and they average 2 ½ days each. That would work out to something like this:

*4 people x 8 hours x 2.5 days x 21 tours = 630 hours +/- to complete the summer tours*

After the summer tours/inspections a set of new routes is created where 2 man crews go back out to reassess the line striping failures to see if any changes to the road have been made and this can take 1 person another 1 to 2 months to create the routes (October and November) as this depends on how many failures there were during the summer inspections.

For the fall line striping tours we pick from the same pool of people and create only two person teams for each tour. On average we may have around 700 line striping failures needing reassessment and a team can usually complete 75 sites during an 8 hour day on average. That would work out to something like this:

*700 failures / 75 sites = 9.33 days needed to complete the fall tours*

or

*2 people x 8 hours x 9.33 days = 149.28 hours +/- to complete the fall tours*

**Question#3:** *How many miles of highway do you assess?*

**Answer:** We maintain 17020 lane miles of highway across Maryland but (as stated in the chart above) we only grade 1/3 of those lane miles annually. That comes out to 5673.33 +/- miles that we inspect for our summer tours.

The fall line striping tours vary based on the number of failures and distance between failures.

**Question#4:** *You indicate that the deliverable is a "process" and a guidance document. Do you actually want a fully functioning route optimization tool that works within your GIS software?*

**Answer:** Yes, we want a fully functioning route optimization tool.

**Questions#5&6:** *This solution appears to fall into the category of the Capacitated Arc Routing Problem, which is similar to the Chinese Postman Problem, where you have N vehicles (each with an 8-hour work day capacity) that must visit K arcs within a network (each with demand D for each arc). The solution is therefore to balance the vehicles to visit each arc in the network over a series of days/months). [Solution Type 1]*

*Another option of course is to create a severely generalized scheduler where one might approximate the capacitated arc routing problem and simply break the network down into a series of points that get visited (ensuring there is a point on the endpoint and center of each arc so that all arcs are visited). This of course would not guarantee workload balancing but might provide a much less expensive solution. Would you be willing to implement a more generalized scheduler? [Solution Type 2]*

**Answer:** We are interested in [Solution Type 1].

**Question#7:** *Let's say inspections are being done in Western Maryland. Do you have those inspections handled by the Western Maryland offices, or would the inspectors travel out from other offices? And, is there a central depot(s) from which the inspector travel?*

**Answer:** The pool of MCARS participants has representatives from each of our 7 engineering districts. The four-person inspection teams are comprised of two central office people and two district reps. A district rep will never be on a team which is conducting inspections within the area that they work. This is done to remove any subjective or unfair grading by team participants. The local tours begin and end each day at our Central Office while the overnight tours begin at our Central Office with two overnight stays and end back at the Central Office on the third day.

**Question#8:** *On average, how many miles of inspection are completed in a single day by a crew? Do some sections of road take longer than others?*

**Answer:** This is a tough question to answer because of the different dynamics of our state. On some tours a crew could easily cover over 100 miles in rural areas. Other tours in urban settings with a lot of traffic, signals, pedestrians, and road construction interruptions may only cover 50 or less. A safe estimate would be around 75 to 85 miles a day.

Yes, some sections of road do take longer (as stated above). Interstates are usually the fastest to complete while urban closed sections of road take longer.

**Question#9:** *Is the primary goal to route inspectors through each road, or to create zone balancing so that there is an equitable distribution of labor among the N inspection crews?*

**Answer:** The primary goal is to guide each team efficiently and effectively through the specified segments while capturing the needed data. There is no balancing or equitable distribution of labor as participation in the program by district representatives is not required and scheduling of is based on their availability.

**Question#10:** *Is the creating, updating, and scheduling of the summer and fall inspections performed manually, or with the aid of a GIS? Do you employ any routing software to complete this?*

**Answer:** Manually, without employing any routing software.

**Question#11:** *What is the current process you use to determine how to break the State up into the 21 tours?*

**Answer:** The number of tours is based on past history of the number of sites that can be viewed in a single day and multiple days and leading back to an appropriate stop location. There are often occasions where the team finishes early or late.

**Question#12:** *Once a crew is assigned, how do you determine the routing? Is this done with a GIS or manually?*

**Answer:** The route is prepared based on past history. The route established many years ago was performed using pinpoints of segments on a paper map and “connecting the dots” and then preparing written directions to correspond. It is done manually.

**Question#13:** *Do your tours focus on a particular 1/3 of the State (i.e. Western, Central, Eastern), or are they randomly scattered throughout the State?*

**Answer:** 1/3 of the entire state is viewed. As an example, if a particular county has 500 lane miles, 167 lane miles total in that county will be viewed on at least two occasions each review season.

We're not required to inspect 1/3 of the system, however, without a good inventory

of assets we'd be concerned with evaluating much fewer segments. As an example, if we reviewed 10% of the system and only had an opportunity to view 1 of a particular asset for a particular Shop (i.e., end treatment or landscaped area), a failure would give a LOS of 0% for that particular asset. Conversely, a pass for that same asset would give a LOS of 100%, neither of which are correct. A statistical sampling process with a minimum threshold number of each asset in each shop could be explored in this research.

**Question#14:** *Do you have access to a commercial routable network dataset?*

**Answer:** Not really. We are limited to the routing tools/networks available through the state AGOL licensing.

**Question#15:** *Does SHA have a routable network?*

**Answer:** No.

**Question#16:** *Do you have a preference in either the creation of a routable network or use of a commercial routable network dataset?*

**Answer:** The most efficient MCARS tour route results may include local, county, and state routes. A commercial routable network would likely best serve this purpose.

**Question#17:** *Will the tool be used for planning purposes in the office or for on the fly route generation in the trucks?*

**Answer:** The tool will be used for planning purposes in the office.

#### **RFP#05: Inventory of Rock Slopes in Maryland**

**Question#1:** *Does this include privately owned land or only publicly owned land?*

**Answer:** No, this research does not include rock slopes on privately owned land.

**Question#2:** *What is your current process for assessing vulnerable rock fall areas?*

**Answer:** We do not currently have a formal process for assessing rock slopes. Visual inspections were conducted periodically and in response to District requests.

**Question#3:** *Have you ever done a statewide survey of this nature before?*

**Answer:** We started collecting rock slope locations in the past years and have a spreadsheet of this limited information, but no systematic statewide survey has been conducted.

**Question#4:** *Do you have locations of historic rock falls?*

**Answer:** Yes, they are in the MD 135 Westernport area and along I-68.