

APPENDIX A

Industry Survey

1. Which of the following best describes your employer? [22 responses]

- a. Owner/State Agency [22/22]
- b. Consultant [0/22]
- c. Academic [0/22]
- d. Other [0/22]

2. Which of the following best describes your role at your employer? [22 responses]

- a. NBIS Inspector [1/22]
- b. NBIS Inspection team leader [11/22]
- c. Administrator (NBIS or other) [9/22]
- d. Other [1/22]

The one user response for “Other” was “District Bridge Design Engineer.”

3. Are you a licensed engineer? [22 responses]

- a. Yes [9/22]
- b. No [12/22]
- c. Other [1/22]

4. How many years of NBIS inspection experience do you have? [22 responses]

- a. <2 years [0/22]
- b. 2-5 years [2/22]
- c. 5-10 years [8/22]
- d. >10 years [12/22]

5. Have you contributed to writing bridge inspection policy for your state or employer? [21 responses]

- a. Yes [6/21]
- b. No [15/21]

6. Which of the following bridge inspection courses have you completed (select all that apply). [61 selections]

- a. Safety Inspection of In-Service Bridges (NHI/FHWA) [13/61]
- b. State-specific Inspection Training Course [21/61]
- c. Fracture-critical Inspection Training Course (NHI/FHWA) [17/61]
- d. Scour-critical Inspection Training Course (NHI/FHWA) [8/61]
- e. Other [2/61]

The one user response received for “Other” was “many refreshers.”

7. Please list the top three states in which you have performed the most recent inspections. [24 responses. All 50 states, Puerto Rico, and the District of Columbia were given as options, but options with zero selections have been omitted for brevity.]

- a. Illinois [3/24]
- b. Kentucky [1/24]
- c. Missouri [1/24]
- d. Ohio [18/24]
- e. Texas [1/24]

8. **Which types of bridge inspections with element-level data collection have you performed (select all that apply)?** [32 selections]
- a. Conventional [20/32]
 - b. Complex (e.g. major river crossing) [12/32]
9. **How many routine bridge inspections with element-level data collection have you performed in the last calendar year?** [20 responses]
- a. <10 [4/20]
 - b. 10-50 [6/20]
 - c. 50-100 [0/20]
 - d. >100 [10/20]
10. **In your busiest years, how many routine bridge inspections with element-level data collection did you perform each calendar year?** [20 responses]
- a. <10 [1/20]
 - b. 10-50 [3/20]
 - c. 50-100 [2/20]
 - d. >100 [14/20]
11. **How many complex (e.g. major river crossing) routine bridge inspections with element-level data collection have you performed in the last calendar year?** [12 responses]
- a. 0 [1/12]
 - b. 1-2 [2/12]
 - c. 3-5 [2/12]
 - d. 6-10 [1/12]
 - e. >10 [6/12]
12. **In your busiest years, how many complex (e.g. major river crossing) routine bridge inspections with element-level data collection did you perform each calendar year?** [12 responses]
- a. 0 [0/12]
 - b. 1-2 [2/12]
 - c. 3-5 [2/12]
 - d. 6-10 [1/12]
 - e. >10 [7/12]
13. **Approximately how many bridges have you inspected in your career?** [22 responses]
- a. <50 [1/22]
 - b. 50-100 [0/22]
 - c. 100-250 [2/22]
 - d. 250-500 [3/22]
 - e. >500 [16/22]
14. **Which of the following do you think best defines the objectives of routine bridge inspection with element-level data collection?** [20 responses]
- a. Assess the global condition state of an element. [2/20]
 - b. Identify small defects which could potentially lead to further element degradation or failure. [5/20]
 - c. Quantify the length, area, and/or volume of a defect size. [10/20]
 - d. Determine whether the structure is performing its intended function. [3/20]
15. **During a typical routine bridge inspection with element-level data collection, what access methods are necessary on the majority of inspections (90% or greater)?** [20 responses]
- a. Unaided visual inspection from the ground [9/20]
 - b. Aided visual inspection from the ground (binoculars/optics) [5/20]
 - c. Visual inspection AND manual aided access (ladder, rope, light climbing) [4/20]

- d. Visual inspection AND mechanical access (lift, UBI truck, powered platform, rope access) [2/20]
16. **Which of the following would cause a change/escalation in type of bridge inspection access (select all that apply)?** [35 selections]
- a. The inability to approximate size of defect to 1" or less tolerance [7/35]
 - b. The inability to see the full 360 degree all secondary and non-critical members [4/35]
 - c. A defect which is suspected to jeopardize function of the bridge/member [18/35]
 - d. A minor defect which is NOT suspected to jeopardize the function of the bridge, but cannot be fully seen [6/35]
17. **How close do you think an inspector should be to a bridge element to perform a routine bridge inspection (non-fracture critical) with element-level data collection (select all that apply)?** [28 selections]
- a. Close enough to visually assess the condition state based on experience and/or judgement (and give appraisal on impact to structure) [18/28]
 - b. 20 feet or less [4/28]
 - c. 10 feet or less [4/28]
 - d. Arm's length [2/28]
18. **What equipment do you typically have available on routine bridge inspections with element-level data collection (select all that apply)?** [56 selections]
- a. Binoculars [15/56]
 - b. Ladder [18/56]
 - c. Lift [6/56]
 - d. Rope access [4/56]
 - e. UAS [5/56]
 - f. UBI vehicle [6/56]
 - g. Other [2/56]
19. **What is your comfort level for using unmanned aerial systems in routine bridge inspections with element-level data collection for the following?** [20 responses]
- a. Extremely uncomfortable [2/20]
 - b. Somewhat uncomfortable [2/20]
 - c. Neither comfortable or uncomfortable [8/20]
 - d. Somewhat comfortable [4/20]
 - e. Extremely comfortable [4/20]
20. **What is the perceived comfort level of your employer for using unmanned aerial systems in routine bridge inspections with element-level data collection for the following?** [20 responses]
- a. Extremely uncomfortable [1/20]
 - b. Somewhat uncomfortable [4/20]
 - c. Neither comfortable or uncomfortable [8/20]
 - d. Somewhat comfortable [5/20]
 - e. Extremely comfortable [2/20]
21. **What is the perceived comfort level of your State DOT for using unmanned aerial systems in routine bridge inspections with element-level data collection for the following?** [20 responses]
- a. Extremely uncomfortable [1/20]
 - b. Somewhat uncomfortable [2/20]
 - c. Neither comfortable or uncomfortable [8/20]
 - d. Somewhat comfortable [7/20]
 - e. Extremely comfortable [2/20]
22. **Does your state and/or employer have defined policies for UAS inspection? If yes, please specify (e.g. training, standard operating procedures, general policies, etc.)** [20 responses]

- a. Yes [10/20]
- b. No [10/20]

The eight user responses received were:

- "Policy is that you may have to at times be hands on if the defect warrants it"
- "Central Office has trained inspector"
- "FAA 107 pilot bridge inspectors"
- "FAA license to operate"
- "Training, FAA Certification, and standard operating procedures"
- "I know we have some if not all that is listed above, I just don't know enough to comment"
- "Drone pilots are trained and licensed...Unfamiliar with specifics"
- "https://uas.ohio.gov/home."

23. **Do you or your employer currently use UAS for bridge inspections?** [20 responses]

- a. Yes [14/20]
- b. No [6/20]

24. **What UAS platforms (airframes) do you or your employer use for bridge inspections?**

The nine user responses received were:

- "Unsure"
- "Do not know"
- "unknown"
- "drones"
- "DJI"
- "DJI and Skydio"
- "Skydio"
- "Skydio2"
- "Skydio2 primarily. We have access to other drives through our State's UAS center."

25. **What types of UAS data do you collect and use for bridge inspection (select all that apply)?** [24 selections]

- a. Photos [14/24]
- b. Videos [7/24]
- c. Other (please specify) [3/24]

The three user responses received for "Other" were "Live", "Infrared", and "flight data."

26. **How do you or your employer use UAS data for bridge inspections?**

The eight user responses received were:

- "complimentary photos"
- "Rate bridges"
- "Assess need for further in-depth inspections"
- "Enhanced visual inspection of non critical elements and defects"
- "We use drones to supplement ground inspections of critical features such as pin/hangers, hinges, questionable bearings, suspected defects, infrared for delaminated areas, inspection of high up bridge in non snooper years, and some bridges we've moved from a 2 year snooper cycle to a 5 year snooper cycle where traffic control is dangerous and bridge conditions are good/stable."
- "We have central office pilot take photos for us"
- "Use photos of specific areas to document/monitor deficiencies. Real-time estimation of element level quantities."
- "supplement Routine Inspections, backup to snooper truck inspections and operations."