CHAPTER 8

UNDERWATER INSPECTION

8.01 Purpose

The National Bridge Inspection Standards (NBIS) require each state to inspect underwater portions of the substructure and surrounding channel and to establish criteria to determine the level and interval to which the members must be inspected. The regular inspection and evaluation of submerged components is vital in determining the overall condition of the components, documenting changes that may have occurred since the previous inspection, developing effective strategies to mitigate scour through the use of countermeasures, and ensure the continued safe use of the assets by the motoring public. Since Michigan's National Bridge Inventory currently has over 7,000 structures over water, comprising nearly 70 percent of the statewide inventory, it is important to implement correct and effective inspection techniques for the proper evaluation of the bridges. This chapter supplements the techniques, requirements, and inspection procedures provided in the FHWA *Bridge Inspector's Reference Manual* and AASHTO *Manual for Bridge Evaluation*.

8.02 Underwater Inspection Methods

FHWA defines underwater inspection as inspection of the underwater portion of a bridge substructure and the surrounding channel, which cannot be inspected visually at low water or by wading or probing, and generally requiring diving or other appropriate techniques. MDOT accepts three inspection techniques which are classified as wade and probe, boat and probe, and underwater diving inspection. The method employed is recommended to be based according to the maximum variation measured from the normal water surface elevation to the channel bottom at areas adjacent to the substructure unit(s). The normal water surface is defined as the level of water that is indicated by the long-term presence of surface water.

The following water depths should be used for selecting the appropriate method of inspection:

- Wade and Probe – Water depths of 4 feet or less
- Boat and Probe – Water depths of 4 feet to 10 feet
- Underwater Diving Inspection – Water depths exceeding 10 feet

Wade and probe and boat and probe should be performed during every routine inspection when water depths do not require that a diving inspection is conducted at the structure. Underwater diving is necessary during every routine inspection when there is limited or no freeboard available to adequately inspect the bottom deck surface, superstructure, substructure, or culvert.

When safety concerns arise the team leader is responsible for documenting the issue on the inspection report and providing a recommendation to the bridge owner for an alternate means to complete the work. Situations requiring a delay may occur due to safety reasons caused by channel flow velocity, heavy

debris, or other hazards. In these cases, the underwater diving inspection should be started by taking stream bed cross sections.

MDOT policy requires all substructure components that are submerged in water at depths of ten feet or greater, measured from the normal water surface elevation to the channel bottom, to be inspected by an underwater diving inspector. Exceptions may be granted in writing by the Bridge Inspection Program Manager in particular cases where it is demonstrated that the boat and probe method is sufficient due to water clarity or other unusual features. For components that are submerged at depths ranging from four feet to ten feet it is the bridge owner's choice on whether to perform the inspection using the boat and probe or underwater diving inspection method. Factors for consideration in determining the method that will be employed should include scour criticality, channel characteristics, substructure type and conditions, and historical data reflecting the necessity to utilize an underwater diving inspector.

SNBI B.IR.03 Underwater Inspection Required is used to identify structures that require an underwater diving inspection. Also, the Underwater Inspection Method coding should be reviewed to determine if it has been accurately coded. If the coding is incorrect the team leader or bridge owner shall adjust it accordingly. Structures that are not over water must be coded "0" to indicate that an underwater inspection is not required. All bridges requiring an underwater inspection are to have one of the following codes for Underwater Inspection Method on the routine inspection report:

1) Wade and Probe – Water depths of 4 feet or less
2) Boat and Probe – Water depths of 4 feet to 10 feet
3) Underwater Diving Inspection – Water depths exceeding 10 feet

8.03 Underwater Diving Levels of Inspection Intensity

The intensity of the underwater diving inspection will be dependent on the type of inspection performed and the observations noted throughout the process. There are three standardized levels that have been provided by the United States Navy to describe the effort required during an underwater diving inspection. All scheduled underwater diving inspections must begin at the Level 1 intensity with Level 2 intensity performed on a minimum of 10 percent of the surface area. Level 3 intensity may be necessary when additional information is required to accurately perform a condition assessment.

A Level 1 underwater diving inspection is a visual inspection conducted to detect deterioration of the substructure elements and to verify the presence of scour. The entire area exposed between the water surface and channel bottom must be inspected. Probing for scour should always occur if the diving inspector believes sedimentation has recently occurred or when the clarity of water does not permit sufficient observation of the channel bottom.

A Level 2 underwater diving inspection requires representative samples of the substructure to be cleaned to remove algae or aquatic growth. Level 2 inspections must be expanded when the findings indicate signs of deterioration that require further analysis. The extent of Level 2 intensity shall be increased according to engineering judgment and the defects discovered. The most common defect may include section loss on steel piles. The team leader or underwater diver should closely inspect portions of

substructure elements from the low waterline to the streambed. On pile structures, horizontal bands, approximately 6 to 12 inches in height should be cleaned at designated locations:

- Rectangular piles - the cleaning includes at least three sides.
- Octagonal piles - at least six sides.
- Round piles - at least three-fourths of the perimeter.
- H-piles - at least the outside faces of the flanges and one side of the web.

When significant portions of substructure units are underwater, areas at least 1 square foot in size at three or more levels on each face of the member should be cleaned. For a substructure unit that is greater than 50 feet in length, it is recommended to clean an additional three levels on each exposed face.

When the results of the Level 2 inspection show advanced deterioration consisting of section loss, or other damage that cannot be detected through visual observation, further inspection and testing will be required for an analysis or the development of repair procedures. Level 3 inspections require non-destructive or partially destructive testing and result from suspected structural concerns. This level of inspection can identify unseen or unexposed damage and section loss. Level 3 intensity requires significant effort to clean the substructure, detailed measurements, and nondestructive testing such as ultrasonic, sample coring or boring, physical material sampling, and in-situ hardness testing. The use of testing techniques is generally limited to key structural areas; areas that may be suspect; or areas that may be representative of the entire bridge member in question.

8.04 Types and Intervals of Underwater Inspections

Scheduled underwater inspection types may be organized and initiated according to several factors such as age, design of the structure, previously observed conditions, and suspected rate of deterioration. Unscheduled underwater inspections are the result of human or environmental factors that could not be anticipated during the previous field examination. The team leader should use the Request for Action as documentation and notification to the bridge owner whenever additional effort or increased intensity level 2 or 3 inspection is necessary to properly assess any concerns.

When water levels exceed 10’ adjacent to the substructure units perform the first underwater diving inspection for each bridge within 12 months of opening to traffic. Initial underwater diving inspections are required for all new structures and structures with portions underwater that have been rehabilitated. For structures under part-width construction that require an underwater inspection, the portion open to traffic must be inspected within 12 months of opening to traffic. If the second stage of construction is open within 12 months of the completion of the first stage, then the underwater inspection for the entire bridge can be performed at one time; however, the underwater inspection must be performed within 12 months from when the first stage was completed and opened to traffic. When work is being done in a dewatered situation an initial underwater diving inspection can be performed in the dry before the dewatering is removed.

Routine underwater inspections are regularly scheduled and executed at intervals dependent on the techniques that may be employed and previously observed conditions. At water depths of 10 feet or less an underwater inspection is often performed at the same interval as the routine inspection and is completed by the team leader using the wade and probe or boat and probe techniques. Where the normal water level exceeds 10 feet an underwater diving inspection must be completed at intervals that do not exceed 60 months. Underwater inspections must be conducted at intervals that do not exceed 24 months when the underwater portions of the bridge, channel, channel protection, or observed scour condition ratings are serious or worse. In lieu of performing a comprehensive underwater inspection, a special inspection may be utilized to monitor the components in serious or worse condition when defects are localized.

All routine underwater diving inspections must begin at the Level 1 intensity with Level 2 intensity performed on a minimum of 10 percent of the surface area. Probing needs to be completed along the perimeter of all substructure units in water. Depth soundings or measurements must also be recorded at multiple locations. Using sonar or a weighted tape measure, record channel depths on a substructure sounding plan in a grid like pattern upstream, beneath, and downstream of the structure. In addition, stream bed cross-sections should be completed at the minimum rate described in the MDOT *Guidelines for Bridge Inspection Frequencies* in order to determine if channel erosion or active scour is present during subsequent inspections. Stream bed cross-sections are required during every underwater diving inspection.

Substructure components or elements of them, exhibiting signs of observed deterioration that do not affect safety must be noted so they may be referenced during the next inspection. When the underwater diving inspector identifies serious deterioration that may affect the structural integrity of the component the intensity of the inspection may be increased to Level 3 for further investigation.

Unscheduled underwater damage inspections must be completed when there are problems reported due to vessel impact or any other cause leading to possible structural capacity concerns. The degree of effort, level of intensity, and components reviewed will depend on circumstances that are unique for each particular event. The inspection may be limited to only include an evaluation of the protective systems or a single substructure element. However, if the limits of the damage are unknown it shall initially include a Level 1 to define the areas that have been impacted. Depending on the degree of damage, a Level 2 or Level 3 inspection may be required to verify severity or provide information for the design of remedial repair measures. If the safe load capacity is significantly affected or closures are implemented the incident is a critical finding and must be reported to FHWA.

In-depth underwater inspections may be initiated as a result of observations identified during a scheduled routine underwater inspection, deficiencies found during a damage inspection, or any other occurrence where additional information is required for further evaluation. There are also instances where bridge owners of complex or unique structures schedule a detailed appraisal for every underwater diving inspection to provide additional details for the important and costly infrastructure assets. In-depth underwater diving inspections often begin with a substantial amount of the area being inspected at the Level 2 intensity to quantify the limits of deficiencies.

Special underwater inspections may also be scheduled by the bridge owner for increased monitoring of localized deterioration or other factors where an inspection of the entire substructure is unnecessary.

Scour monitoring inspections may be initiated when scour is suspected during high flow or other events. This type of inspection may be required at any time throughout the year but occur most often after spring precipitation and snowmelt runoff causes rivers to rapidly rise. The collection of debris around a pier or other element in the channel may cause localized scour due to the redirection of flow. The Scour Action High Flow Event report and Scour Inspection Report shall be used to document the observations.

The underwater inspection interval shall be assigned according to observed distress, scour criticality, and sound engineering judgment. Items that often lead to a reduced interval include changes in the condition of elements or channel since the previous inspection, observed scour, substructure design, and maintenance history. For instance, drilled shaft piers located in the channel may not necessarily require an underwater inspection as often as pier walls founded on spread footings if their conditions are identical. Recommendations for the inspection interval may be found in the MDOT *Guidelines for Bridge Inspection Frequencies.* The team leader or underwater diving inspector is responsible for updating the inspection interval when component or environmental conditions warrant.

8.05 Underwater Inspector Qualifications

Team leaders performing underwater inspections using the wade and probe or boat and probe methods do not require any other additional training or certifications than what is described in Chapter 1. However, additional training classes will improve scour comprehension to detect effects before they become significant. Recommended courses offered by the National Highway Institute (NHI) include:

- FHWA-NHI-135085 Plan of Action (POA) for Scour Critical Bridges
- FHWA-NHI-135046 Stream Stability and Scour at Highway Bridges
- FHWA-NHI-135047 Stream Stability and Scour at Highway Bridges for Bridge Inspectors
- FHWA-NHI-135048 Countermeasure Design for Bridge Scour and Stream Instability

The NBIS requires underwater diving inspectors to complete an FHWA-approved underwater bridge inspection training prior to inspecting any structures in the national bridge inventory, and they must have knowledge in bridge safety inspection. In addition to the requirements for the underwater diver, an individual that meets the NBIS team leader requirements must also be on site and actively participate in the inspection. One person can serve as both the diver and NBIS team leader if they meet the requirements. The FHWA approved courses offered by NHI for underwater diving inspectors include:

- FHWA-NHI-130091 Underwater Bridge Inspection (4 days)

Completion of the FHWA approved comprehensive bridge inspection training prior to June 6, 2022 satisfies the training requirement.

All underwater diving inspectors are subject to the requirements specified under 29 CFR Part 1910 *Commercial Diving Operations*.

8.06 Underwater Inspection Procedures

Due to the extraordinary challenges and complex nature of underwater inspections, especially those that require an underwater diving inspection, proper planning and early identification of factors that may inhibit the work are necessary for a successful inspection. When consultants are secured to perform underwater diving inspections the bridge owner should make the entire contents of the bridge file accessible for them to review. This action will allow information to be provided that will benefit the team leader and underwater diving inspection team and assist in the resolution of concerns prior to the commencement of field work. The diving inspection team should allow adequate time for proper planning and development of procedures that will aid in a safe and successful underwater inspection. When an underwater diving inspection is required the inspection procedures shall be adequately documented in the Underwater Diving Inspection Report.

8.06.01 Underwater Inspection Procedures – Bridge Owner Responsibilities

The bridge owner is responsible for ensuring that the underwater diving inspection is performed by qualified staff that meet the requirements outlined in the NBIS as well as state requirements. Copies of certifications for the underwater diving inspector and team leader must be retained by the bridge owner for future quality assurance or FHWA National Bridge Inspection Program reviews. Local agency bridge owners are recommended to comprehensively review the qualifications and experience of the underwater diving inspector and team leader if the organization performing the inspection has not been prequalified by MDOT.

Inspections should be assigned a minimum of 30 days prior to the required inspection date. Enough time should be granted to the inspection team for adequate review so proper steps may be taken during the planning and procedures development stages.

The bridge owner should review the work recommendations provided in the underwater inspection report for actions that will preserve the condition of the elements through maintenance, rehabilitation, or the implementation of scour countermeasures. If at any time during the underwater diving inspection a recommendation for an increased amount of Level 2 effort is requested, then the bridge owner shall determine whether the additional work is necessary. Consultation with an experienced structural or hydraulics engineer for assistance in determining when the scope of work should be increased may be required.

8.06.02 Underwater Inspection Procedures – Team Leader Responsibilities

As previously described, the depth of water will have the greatest influence in determining the underwater inspection technique that will be utilized. Prior to performing any field work, the team leader or underwater diving inspection team must review the entire contents of the bridge file and become particularly familiar with previous inspection reports, as-built plans, and stream bed cross. Special attention also needs to be provided to areas that were previously affected by scour, or where the underwater diving inspection report noted deterioration of the substructure components. This action will

also aid the diving inspection team in identifying areas where Level 2 intensity inspections may be concentrated.

The Scour Plan of Action (POA), Scour Action Inspection, and Scour Action High Flow Event documents must also be reviewed for scour critical structures. The team leader should provide recommendations to the bridge owner when improvements to the POA may be incorporated, and also review the information to determine where previous scour locations have occurred.

Procedures need to be developed prior to beginning an underwater diving inspection to ensure a safe and comprehensive inspection. Underwater diving inspection procedures must reference applicable OSHA regulations as well as FHWA and MDOT guidance. MDOT also recommends that the dive team members periodically review FHWA-NHI-23-027 Underwater Bridge Inspection. The underwater diving inspection procedures need to confirm that the team leader on-site meets FHWA and MDOT qualification requirements. In addition, the procedures must confirm that the dive team members meet the qualification requirements of OSHA 1910.410, and that the number of dive team members present meet OSHA requirements. The diving procedures must document that a safe dive practices manual consistent for OSHA commercial diving operations was reviewed by the dive team. The underwater procedures need to confirm that a dive operations plan was developed that includes team member assignments, inspection procedures, equipment requirements, emergency information and procedures, and a review of potential hazards and mitigation techniques that should be employed. The dive operations will need to be made available upon request by the bridge owner or MDOT.

The level of inspection and methods to collect, measure, and record data will need to be deliberated prior to beginning any field work. Factors such as visibility, flow discharge, and the type of substructure units in the waterways will bear heavily on the complexity of the dive. The planning stage should also take into consideration all known information relating to the waterway, use, and structural characteristics related to the components that will be inspected. Inspection procedures must be developed for all substructure units submerged in water. The procedures need to account for material type, common defects, location and severity. The procedures need to include probing for scour. Procedures need to be developed for evaluating channel condition, channel protection, scour condition, substructure navigation protection, and scour countermeasures.

The underwater dive team shall also be responsible for determining if the waterway is navigable and Coast Guard permits are required. Bridges located over private canals or structures serving multiple uses may have special requirements. The inspection procedures must include documenting whether special contracting, coordination, or permits are necessary. If required, contact information and recommended lead time needs to be provided.

The underwater diving inspection procedures must document the contents of the bridge file that were reviewed prior to the inspection. Following review of the bridge file, develop a list of access and inspection equipment from SNBI B.IE.12 and include the information in the inspection procedures.

The inspection procedures need to confirm the most basic requirement of underwater diving bridge inspection; include confirmation that Level 1 inspection will be conducted on 100 percent of submerged substructure units. Provide confirmation that Level 2 or 3 inspection will be conducted on 10 percent or more of submerged substructure units. The procedures need to detail the extent and proposed location(s) that Level 2 and/or 3 inspection will be conducted. Provide documentation requirements for Level 1, 2, and 3 intensity inspections.

The inspection procedures must also note that stream bed cross sections of the channel will be taken along each fascia and recorded. In addition, document that depth soundings or measurements will be taken in a grid like pattern upstream, beneath, and downstream of the structure. Finally, include information on access roads, staging areas, boat launch sites, and if any vehicular traffic control is necessary.

When the team leader or underwater diving inspection team arrives at the structure, but prior to commencing the underwater inspection, an evaluation of the waterway shall begin. At a minimum this review shall include inspection for signs of bank erosion, evidence of channel migration, debris buildup, and obstructions that were not included on the previous inspection report. When the routine inspection is not being performed concurrently, deficiencies visually observed on the substructure above the waterline must be noted in the underwater diving inspection report.

The first task to be performed by the team leader for either type of probing method is to review the area from the channel bank to determine if safety concerns are visible, a preferential access location, and to inspect the channel banks for signs of instability. Probing must occur along the entire length of all submerged substructure elements. The team leader is required to update Channel and Channel Protection condition ratings based according to the visible signs encountered.

When footings are included in the substructure design, the extent of examination must extend outside the limits of it to determine if scour or undermining has happened. When the channel bottom is above the top of footing, but the footing may be distinguished during probing, a comment shall be added to BSIR Abutments or Piers denoting the approximate depth of cover encountered.

Upon beginning an underwater diving inspection, the diving inspector shall follow the developed plan to determine if damage or deterioration is present on the submerged exposed surfaces of all components in the channel. A review of the structure, environment, and current conditions must be completed prior to diving.

Underwater inspections should verify whether scour exists and if defects are present. If the clarity of the waterway does not allow surfaces to be inspected visually the underwater diving inspector shall feel for irregularities on the surfaces of the elements. Deficiencies observed or detected above and below the water surface must be noted in the report for all substructure units that have surfaces submerged. All previous areas of concern should be reviewed on the underwater diving inspection report to confirm that they were inspected, and comments regarding their condition shall be included regardless of the assigned rating.

Chapter 7 of the FHWA *Bridge Inspector's Reference Manual* provides detailed information for deficiencies encountered for each material type. A summary of the common defects is included in Table 8.06.01.

Table 8.06.01 Common Substructure Material Defects

Concrete	Steel	Timber	Masonry
Scaling	Corrosion	Decay/Rot	Cracks
Cracks	Loss of Section/Holes	Abrasion	Mortar Loss
Spalls	Cracks	Collision	Delamination
Exposed Reinforcement	Loose Connections	Biological	
Significant Delamination			

The approximate quantity and location of all defects shall be observed and documented to assign an accurate condition rating on the inspection report. Navigation protection systems and lights shall be inspected to determine whether they are functioning and any signs of deterioration rendering them ineffective must be noted. Substructure Navigation Protection coding must be verified that it reflects current conditions.

In cases where wade and probe or boat and probe does not allow for an accurate condition determination, the team leader must notify the bridge owner so an underwater diving inspection may be scheduled. The diving inspection must be completed within 12 months.

When existing scour countermeasures are present they shall be inspected for effectiveness, defects, and damage. Riprap should be inspected for signs of displacement and disintegration. Cracks in armored channel are often negligent to overall performance, but wide cracks or spalls may lead to loss of material beneath the system and undermining. Separation or sagging of gabions and grout filled bags indicate the initiation of failure and reduced usefulness. Sheet piling that was installed as a scour countermeasure should be inspected to verify the extent of section loss and ensure adequate toe depth.

The elevation of the river bed relative to an established USGS datum must be measured for all structures over water. These measurements must be taken at the previous locations along the length of the bridge that is over the water and recorded on the *Stream Cross Section Report* form. This information must be compared to the previous data, if available, in the form of a graph.

8.07 Bridge or Culvert Safety Inspection Report

For either probing method which shall occur during the scheduled routine bridge safety inspection, the observations and deficiencies shall be entered on the BSIR. Ratings shall be assigned to the appropriate substructure or culvert items of the report according to the MDOT NBI Rating Guidelines. Scour that may affect the structural capacity shall be coded in poor or worse condition according to the proximity to the substructure or culvert and the extent of loss. The team leader shall update the following condition ratings as applicable:

- Substructure Condition Rating

- Culvert Condition Rating
- Scour Condition Rating
- Channel Condition Rating
- Channel Protection Condition Rating
- Overtopping Likelihood
- Substructure Navigation Protection

When scouring of the substructure elements cause a safety concern, the team leader should submit an RFA to the bridge owner for the installation of scour countermeasures. Protective measures for the detection of minor scour may be identified by a work recommendation provided in the report. For MDOT owned bridges, the bridge owner must contact the Design Division Hydraulics Engineer for recommendations regarding the type and design of countermeasure. It is recommended that local agency bridge owners secure a consultant with hydraulic design experience to perform the evaluation. See Chapter 6 for instructions on updating the scour appraisal and scour vulnerability coding.

8.08 Underwater Diving Inspection Report

Effective April 1, 2025, in addition to the MiBridge/BrM Underwater Diving Inspection Report, a comprehensive underwater inspection report must be submitted in MiBridge/BrM to remain in compliance with the NBIS. This change is a result of the calendar year 2023 National Bridge Inspection Program Review in which MDOT was determined to be in non-compliance with Metric 17: Inspection Procedures – Underwater. A Michigan Underwater Diving Inspection Report Checklist will be utilized to assist the inspection team and shall be submitted with each report.

8.08.01 MiBridge/BrM Underwater Diving Inspection Report

An Underwater Diving Inspection Report (UDIR) shall only be completed when an underwater diving inspection is usually required. The contents of the report consist of the data that must be entered in the UDIR using the MiBridge/BrM web-based system. The report needs to be entered within 30 calendar days of finishing field activities.

The Special Underwater Inspection section includes fields for inspector name, agency/company name, inspection interval, and inspection date. The team leader's name and agency/company name are automatically generated according to the username and login information entered. The inspector may modify the monthly inspection interval by changing the previously assigned value. The updated May 6, 2022 NBIS provides restrictions for the interval length. If underwater portions of the abutments or piers, channel, channel protection or observed scour condition are rated in serious or worse condition the inspection interval must be 24 months or less. However, if the underwater portions of the bridge are rated in serious or worse condition and a special inspection is being conducted to monitor localized deficiencies the underwater diving inspection interval may be greater than 24 months. Since the date of the inspection often varies from the date of entering the report the inspector must select the date that field work occurred from the auto-populating calendar.

The Inspection Staff and Equipment section includes fields for entering the engineer, underwater diving inspector, and tender names. The team leader entering the report must verify that an NBI certified diver was used. The type of diving equipment must be selected. Document whether surface-supplied air or SCUBA is utilized. SCUBA gear is not recommended to be used for depths greater than 130 ft sea water. SCUBA gear is not recommended to be used in currents that are exceeding 1 knot unless diver is line tended. Surface-supplied air is not recommended for depths greater than 220 ft sea water. A decompression chamber should be on-site and ready for use for dives that exceed 100 ft sea water and for dives that are outside the no-decompression limits. Minimum equipment requirements are specified for diver and diving equipment, and equipment testing. OSHA 1910.424 covers SCUBA diving and OSHA 1910.425 covers surface-supplied air diving. Within this section also note the location of the nearest boat launch as well as any safety concerns that exist. If no boat launch exists state where or how the substructure units were accessed.

The General Notes section allows the team leader to input any additional information that cannot be entered elsewhere on the form. This may include an overall summary of the elements condition, comments regarding limiting factors that affected the inspection, or other remarks that are beneficial to document. When the inspection requires more than one day to complete, or when a follow-up visit must be performed by the team leader that entered the most current report, comments shall be included in the field describing the cause.

The Inspection Procedures field should reference that complete bridge specific underwater diving inspection procedures are attached to the report.

The Navigation Protection Systems section allows the team to provide comments related to the type(s) of systems at the bridge. Selection boxes are included to identify the system(s) employed which include:

- Fender Timbers
- Berm
- Dolphins
- Other

Notes shall be included for impact damage or decay of the protective systems in the channel or attached to the substructure. Clearance measurements shall be provided for all structures located over navigable waterways and must be measured normal to flow between abutments or any existing protective systems. These measurements should be compared to the standard for navigation clearances provided on the United States Coast Guard Office of Bridge Programs web site. This field shall also note whether the navigational lighting is functional at the time of inspection.

When scour countermeasures exist the type and condition shall be selected in the Scour Protection section. Common types that have been listed on the report include:

- Riprap
- Grouted Riprap

- Wire Enclosed Riprap
- Grouted Bags
- Sheet Piling
- Articulated Blocks
- Old Bridge Abutment
- Other

Data concerning the weather encountered during the inspection and channel characteristics are provided in the Waterway and Weather Conditions section. Required fields that must be entered include current speed of the water velocity, turbidity during the dive, stream bed material, the maximum depth encountered in the channel, weather conditions on the day of the dive, air and water temperatures. The Marine Growth on Structure field also provides an opportunity to indicate whether algae, zebra mussels, or other aquatic organisms are covering the surface of the elements.

The Inspection Details section provides several fields where information regarding the physical characteristics and condition of the substructure components may be identified. Observations concerning the stream bed channel and slope shall be entered in the Waterway and Bank Observations field. Data entry fields are also delineated for substructure observations above and below the waterline. Each specific element should be clearly defined with comments provided noting defects and approximate locations regardless of their condition. Since debris in the waterway may lead to localized scour effects comments regarding the extent and impacts observed at the time of inspection must be entered. Suggestions must also be included in the Recommendations field concerning the installation of scour countermeasures or changes to condition coding for the bridge owner or team leader to review. The inspector shall also indicate if video, photographs, site plan, and a stream bed profile have been completed.

The team leader must always provide recommendations when scour is identified or for any submerged structural components that are rated in Fair or less condition. MiBridge/BrM has several preset options in the recommendations dropdown which includes an “other” recommendation type for activities that may be unique. The tasks must be assigned to a Low, Medium, or High priority and a description of the work shall be entered noting the location.

8.08.02 Comprehensive Underwater Diving Inspection Report

The comprehensive report must be uploaded to MiBridge / BrM within 90 days of completing the underwater diving inspection. This report will be reviewed periodically by the bridge owner, MDOT, MDOT’s QA Consultant, and FHWA. A Michigan Underwater Diving Inspection Report Checklist must be utilized and completed to ensure each report provides adequate information.

The report should be organized in the following manner with the content provided for each section:

a. Title Page: Include the structure number, facility, feature, inspection start date, inspection end date, consultant name(s), and an elevation photo.

b. Table of Contents: Provide titles and page numbers for significant sections, subsections, and appendices.

c. Executive Summary: Clearly describe the structure design type, location, length, year constructed, and the substructure units inspected. Provide the names of the team leader, diver, dive supervisor, and dive tender(s) which participated in the inspection. State the type of underwater diving inspection; routine, initial, damage, in-depth, special, or scour monitoring should be described. In addition, describe the general condition, foundation type, observed scour or deterioration, pier protection (if any), and work recommendations. Prior to 2026, the current and proposed ratings for SI&A Items #60, #61, #71, #111, and #113 shall also be listed. Include the proposed rating for SNBI B.C.15 as well. Beginning in 2026, list current and proposed ratings for SNBI items B.C.03, B.C.09, B.C.10, B.AP.02, B.N.06, B.C.11, and B.C.15.

d. Inspection Procedures: Reference OSHA, FHWA, and MDOT guidance. The inspection procedures confirm that the team leader on-site meets FHWA and MDOT qualification requirements. The inspection procedures confirm that the dive team members meet the qualification requirements of OSHA 1910.410. The inspection procedures confirm that the number of dive team members present meet OSHA requirements. The inspection procedures reference that a safe dive practices manual consistent for OSHA commercial diving operations was reviewed by the dive team. The inspection procedures reference that a dive operations plan was developed that includes team member assignments, inspection procedures, equipment requirements, emergency information and procedures, and a review of potential hazards and mitigation techniques that should be employed. The dive operations plan will be made available upon request by the bridge owner or MDOT. Inspection procedures have been developed for all substructure units submerged in water. The procedures account for material type, common defects, location and severity. The procedures include probing for scour. Inspection procedures have been developed for evaluating channel condition, channel protection, scour condition, substructure navigation protection, and scour countermeasures. The inspection procedures include documenting whether special contracting, coordination, or permits are necessary. If required, contact information and recommended lead time is provided. The inspection procedures document the contents of the bridge file that were reviewed prior to the inspection. Inspection procedures include a list of SNBI B.IE.12 access and inspection equipment. The inspection procedures confirm that Level 1 inspection will be conducted on 100 percent of submerged substructure units. The inspection procedures confirm that Level 2 or 3 inspection will be conducted on 10 percent or more of submerged substructure units. The inspection procedures detail the extent and proposed location(s) that Level 2 and/or 3 inspection will be conducted. The inspection procedures provide documentation requirements for Level 1, 2, and 3 intensity inspections. The inspection procedures note that stream bed cross sections of the channel will be taken along each fascia and recorded. The inspection procedures

describe that depth soundings will be taken in a grid like pattern upstream, beneath, and downstream of the structure. The inspection procedures include information on access roads, staging areas, boat launch sites, and if any vehicular traffic control is required.

e. Field Inspection Findings: Include a tabular summary of inspection observations above and below the waterline for substructure units and navigation protection. When footing exposure is present, provide measurements for the depth of scour along each face of the substructure. The field inspection findings and recommended condition rating for the substructure are provided. The type, quantity, and observed condition are clearly described. The locations where Level 2 or 3 inspection were conducted are provided. The field inspection findings and recommended condition rating for the channel are provided. Observations for the channel at the bridge, as well as the channel upstream and downstream only insofar as it threatens the bridge and approach roadway, are clearly described. The field inspection findings and recommended condition rating for the channel protection are provided. Observations for the effectiveness of channel protection devices installed on banks or in the stream to mitigate channel issues are clearly described. The field inspection findings and recommended coding for overtopping are provided. Observations and/or review of documentation are clearly described. The field inspection findings and recommended coding for substructure navigation protection are provided. Observations for the presence and adequacy for fender systems, dolphins, or other systems are clearly described. The field inspection findings and recommended condition rating for scour condition are provided. Ensure observed and measured scour are clearly described. The field inspection findings and recommended condition coding for underwater inspection condition are provided. Observations for the type, number, and severity of defects are clearly described.

f. Substructure Sounding Plan: A sketch of depth soundings taken in a grid like pattern upstream, beneath, and downstream of the structure is provided. The sketch includes abutments (when applicable), piers (when applicable), channel, and any other significant physical features. The location and depth of each sounding around the submerged substructure elements. Labels for each item shown and reference measurements for provided for each span.

g. Substructure Elevation Drawings: A sketch for each substructure element in the water is provided. A sketch for the south, north, west, and east faces of each element are provided on a single page. Then pier cap, pier wall, columns, bents, footing, and tremie are shown as applicable with horizontal and vertical dimensions. The elevations of the water surface, pier cap, pier wall, footing, and tremie are provided. The profile of the water surface and streambed along each face are provided in contrasting color. Defects such as cracking, scaling, delamination, section loss and spalling are included and quantified on the drawings. The locations of Level 2 or 3 inspection are denoted on the drawings.

h. Stream Cross Section Report: Stream bed profile measurements are recorded along the length of each fascia that is over the water The recordings were compared to the previous data, if available, in the form of a graph.

i. Photographs: At a minimum, photographs which include the channel, elevations, substructure units inspected, and any significant defects when water clarity permits are provided.

j. Appendices: Utilize the appendices to include the MiBridge or BrM Underwater Diving Inspection Report and the Michigan Underwater Diving Inspection Report Checklist. If applicable, include the RFA report, US Coast Guard Permit, and any other pertinent documentation.