User's Guide for the Maine Atlantic Salmon Programmatic Consultation (MAP)

Version 1.0, March 2017

Federal Highway Administration

Maine Department of Transportation

U.S. Fish and Wildlife Service

Army Corps of Engineers

Maine Turnpike Authority

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The most current versions of supporting documents for this range-wide programmatic consultation, including the appendices listed above, are posted here: http://www.maine.gov/mdot/maspc/

1 Introduction

This document provides guidance for the implementation of the programmatic consultation for the freshwater portions of the Atlantic salmon Distinct Population Segment (DPS) and its Critical Habitat (Maine Atlantic Salmon Programmatic Consultation [MAP]). This document is based on the June 8, 2016, Federal Highway Administration (FHWA), Army Corps of Engineers (ACOE), Maine Turnpike Authority (MTA), and the Maine Department of Transportation (MaineDOT) Programmatic Biological Assessment for Transportation Projects in the Range of the Atlantic salmon (PBA), and the U.S. Fish and Wildlife Service (Service) Programmatic Biological Opinion, dated January 23, 2017 (PBO). It also reflects ongoing coordination between the participating agencies. The Service, FHWA, ACOE, and MaineDOT jointly developed this User's Guide to be instructional for both transportation agencies and Service Field Offices. We encourage feedback on the User's Guide to facilitate updates and improvements, as necessary. The primary contact for feedback will be Eric Ham at MaineDOT (eric.ham@maine.gov). Additional points of contact are provided in the adjacent text box.

Agency points of contacts for the Programmatic Consultation and/or User's Guide include:

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This User's Guide includes:

- **Standard Operating Procedure (SOP) for Project Submissions:** Guidance for project submission under the MAP for FHWA, ACOE, and their respective non-federal representatives (henceforth "transportation agencies") and SOPs for the Service's review and tracking of the MAP;
- **Project Notification Form (PNF)**: A form for transportation agencies to use for submitting project-level information to the Service Field Office;
- **Habitat Connectivity Design Guidance**
- **Avoidance and Minimization Measures**: Summary of Avoidance and Minimization Measures (AMMs) to be implemented, as applicable, to reduce the potential effects of projects and ensure activities fall within the scope of the MAP (Appendix A and H);
- **Stream Crossing Replacement Post-Project Monitoring Protocol:** Outlines procedures and timing for post-construction monitoring of stream crossing replacements (Appendix E);
- **Turbidity Monitoring Protocol:** Describes the procedures to be implemented by MaineDOT or the MTA when completing in-water turbidity monitoring per MAP commitments (Appendix C and D);
- **Hydroacoustic Monitoring Protocol:** Provides a template underwater noise monitoring plan that outlines technical requirements for sound monitoring when required by the MAP (Appendix F);
- **Bubble Curtain Specifications:** Appendix I;
- **Fish Evacuation and Disinfection Procedures**: Outlines protocols to be implemented when Fish Evacuation is required by the MAP (Appendix G);
- **Mitigation/In-lieu Fee Guidance and Calculations**- (Appendix K- TBD).

The MAP addresses project activities that may affect, are not likely to adversely affect (NLAA); and that may affect, are likely to adversely affect (LAA) the Gulf of Maine distinct population segment (GOM DPS) of Atlantic salmon (*Salmo salar*), a federally endangered species, and its designated critical habitat in Maine, within the jurisdiction of the Service.

2 General Operation

2.1 MAP Users

All parties who plan to use the MAP are encouraged to conduct at least a cursory review of the PBA and the PBO in addition to using the User's Guide as the primary tool to assist all parties through the process. The PBA and PBO contain detailed information on the proposed action, an analysis of the potential effects to the species, and support of effect determinations. The PBA contains more information on the activity descriptions and methodology, while the PBO contains the final AMMs, effect analysis and determinations. If there are any questions regarding interpretation, please discuss with the appropriate agency contacts as necessary or during early coordination (Section 5.1). MaineDOT, MTA, and Service biologists will be the Users discussed in this guide. The Users should have a working knowledge of the Federal Endangered Species Act, biology of Atlantic salmon, and the construction activities discussed in the PBA/PBO. The PBA, PBO, and implementation documents relevant for compliance with the MAP are available at the address below. Updates to the implementation documents will be shared with Users by posting new versions to the MAP webpage. Users should confirm that they have the latest versions by regularly consulting the webpage.

http://www.maine.gov/mdot/maspc/

When the MTA is expecting to use the MAP, a MaineDOT biologist will be assigned to work with the MTA to ensure the project meets the consultation and will aid in completing the PNF.

2.2 Consistency review

The PBA/PBO completed the Endangered Species Act section 7 consultation for projects that qualify. The submittal of the PNF and subsequent review by the Service are a consistency review. The consistency review will ensure that project activities are consistent with what was proposed and consulted on in the MAP. It also verifies that all of the proper AMMs will be applied to the design and construction of the project. The review provides an opportunity to track the extent of potential adverse effects so that the Service can confirm, document, and track project specific Take when necessary.

Because this is a consistency review and not a consultation request, the MaineDOT or the MTA can submit the PNF directly to the Service regardless of consultation level, on behalf of the lead federal agency. The appropriate lead federal agencies should be copied on any submittals to the Service. When the required information is provided and if the project qualifies for programmatic coverage, informal consultation consistency reviews will be completed within 14 days and formal consultation consistency reviews will be completed within 30 days.

Early coordination is a MAP commitment that facilitates pre-PNF submittal information sharing between participating agencies. It enables open dialog about project scope and programmatic coverage to maximize agreement and minimize delay during the consistency review. The coordination will primarily take place

between MaineDOT, MTA, and Service staff. The appropriate lead federal agency should be copied on all early coordination correspondence and should be invited to any early coordination meetings.

2.3 Annual meeting

MaineDOT, FHWA, ACOE, MTA, and the Service will have an annual meeting that occurs no later than March 15 of the following year to discuss the MAP. The MaineDOT, FHWA, ACOE and MTA will provide a report to facilitate discussion. The annual report will summarize program use and Take for the reporting year ("year" refers to the calendar year, January 1 to December 31), the Service average review timelines, monitoring information that may inform potential effect assumptions, and implementation of mitigation activities. The annual report and meeting will address the functionality of the MAP for all parties, as well as other issues that are pertinent. These meetings don't preclude discussions or meetings that occur sooner to address project specific issues in a timelier manner. The annual report will provide:

- A summary of the amount of predicted take as it compared to any reported take during construction;
- A project list and summary of project types;
- Average Service review timelines;
- A discussion of AMM application and effectiveness;
- A report on any monitoring that took place, including hydroacoustic, turbidity, or habitat monitoring and if the results indicate that project effects were greater or less than predicted in the PBO and if any changes, including reinitiation of consultation, may be necessary; and
- Any issues or improvements that may impact the function of the MAP going forward

3 Project Notification Form

This section provides guidance for completing the Project Notification Form (PNF). The PNF is divided into five sections and is designed to briefly describe the action; identify the elements of the proposed action; summarize the design and constructability considerations necessary for the action to be eligible for submission under the MAP; summarize the effects determinations; provide information necessary for the Service to calculate project specific Take, if necessary; and identify required supporting design information where necessary. The PNF is intended to summarize portions of the PBA/PBO and to be used as a guide for determining eligibility for submission under the MAP. Where appropriate, the relevant sections of the PBO are referenced. The PNF also provides MaineDOT/MTA the ability to track take and ensure that the annual limits are not being exceeded. The PBA and PBO contain detailed information on the proposed action, excluded activities, required avoidance and minimization measures, an analysis of the potential effects to the species and their resources, and the basis for effects determinations. The PBO provides the final AMMs, effects analysis and effect determinations.

The following subsections of Section 3 address specific portions of the PNF. All sections of the PNF must be completed in their entirety. If questions or difficulties arise, please contact the appropriate agency points of contact for assistance.

3.1 Section 1 - General Project Information

General project information can be gathered from MaineDOT ProjEx (https://portal.maine.gov/pjx_web/pkgPjxWebFilter.pProjectFilter) and Mapviewer (http://www.maine.gov/mdot/mapviewer/) programs. This portion of the PNF provides the reviewer with general identification and location information of the action.

Eight general activity categories are included in the MAP. In depth explanations of these proposed activities and sub activities are in the PBA. If the proposed action does not fall within one of the general activity categories listed, consult the PBA and/or agency point(s) of contact. A small change in scope may be all that is required to adjust the action so that it fits within the MAP.

Project Site Characteristics

In order to ensure that the User can determine whether a project is suitable for processing, certain baseline conditions and information will be required to establish eligibility for the MAP and to complete the PNF.

- Definition of the action area and an assessment of the habitat within the action area
- Review of mapped and modeled Atlantic salmon resources
  - Maine Department of Marine Resources (MaineDMR) surveyed and mapped spawning, rearing, and migratory habitat
  - Redd mapping by MaineDMR
  - Atlantic salmon habitat model
- Assessment of the likelihood of Atlantic salmon presence
  - Previous projects
  - Request to MaineDMR contact to provide the latest and most relevant Atlantic salmon population data to the action area
  - Determination of life stages potentially present

The PNF requires information on salmon presence, clay substrates, and Atlantic salmon spawning and holding areas. These items relate directly to possible exclusion from the MAP and/or site conditions that require additional early coordination with the Service.

Other Federal Endangered Species in Project Area

If there is an effect to any of the below species or their designated critical habitat, a separate consultation request will be prepared. This notification form will be attached to that consultation request. If the consultation request will utilize separate programmatic consultations, both reporting forms will be packaged together.

3.2 Section 2 - General Activity Category Design Requirements

The location of the proposed project and specific AMMs and design commitments help determine whether the project is eligible for coverage under the MAP. The activity will be stated in the section along with the pertinent design commitments and AMMs.

Activity 1- Stream Crossing Replacements

Activity 2- Bridge Removal

Activity 3- Culvert End Resets/Extensions

Activity 4- Bridge Scour Countermeasures

Activity 5- Bridge Maintenance: Grout Bag Installation and Concrete Repair

Activity 6- Temporary Work Access and Temporary Bridges

Activity 7- Invert Line and Slipline Culvert Rehabilitation

Activity 8- Pre-project Geotechnical Drilling

3.3 Section 3- Constructability Requirements

Each of the proposed activities covered by the MAP has a set of assumptions about how the activity will be constructed and the AMMs required. These are summarized in Sections 2 and 3 of the PNF. These items form the basis for MAP eligibility and effects determinations. This section of the PNF is designed to direct the User to applicable sections of the PBA/PBO. The User must ensure that the proposed action meets all assumptions and AMMs in the MAP. In addition, the User must ensure that the requirements of the MAP are transferred to project Contract Documents.

AMMs (or a summary of applicable AMMs) are listed and summarized in Appendix A. The AMMs vary from commitments to design standards, ensuring standard specifications are met, and special provisions during construction. If any of the applicable AMMs cannot be implemented for a specific project, then that project cannot be covered under the MAP. Please contact the appropriate agencies personal to discuss how the project might be adjusted to allow submittal under the MAP.

3.4 Section 4 - Effects Determinations

Each project processed using the MAP requires an overall effect determination. Effect determinations for the proposed activities and sub activities where provided in the PBA. In the PBO, several of those effect determinations were changed following further analysis and discussions. For the purpose of determining final effect determinations from core activities, please refer to the PBO as it is the most up to date information.
The effect determinations in the PBO were made assuming that all of the AMMs are applied.

Effects to Atlantic salmon

The majority of effects to Atlantic salmon are not likely to adversely affect Atlantic salmon due to the applied AMMs. However, some of the effects could not be minimized below the level of take.

As discussed above, the User will need to know if Atlantic salmon presence is likely or not likely. They will also need to know what life stages are potentially present.

If no life stages of Atlantic salmon are likely to be present in the action area, the project is not likely to adversely affect Atlantic salmon. No further analysis or review of the activity is needed. The presence of Atlantic salmon is also a predictor of whether multiple AMMs are applied to the project. If Atlantic salmon are not likely to be present, the work window is not necessary to use the MAP (though it may be necessary for other species and regulatory processes).

The following activities are likely to result in adverse effects whenever Atlantic salmon are present in the action area:

- Elevated turbidity/sediment transport
  - Cofferdam installation
  - Bypass channel installation
  - Pile installation and removal
- Fish handling evacuation
- Temporary migration/movement barriers
  - Cofferdam installation
  - Bypass channel installation
  - Pier and abutment demolition
- Underwater noise
  - Pile installation with an impact hammer
  - In-water abutment/pier demolition with a hoe ram
- Habitat Alteration
  - Invert line and slipline culvert rehabilitation
  - Scour countermeasure
  - Bank full width (BFW) culverts in Tier 2 Priority Areas
  - Rip rap that is not covered with culvert streambed material
- Permanent movement migration barrier
  - Invert Line and slipline culvert rehabilitation
  - Culvert end extensions
- Water Quality
  - Grout bag installation

Effects to Atlantic salmon critical habitat

The proposed activities and AMMs were designed to minimize effects to Atlantic salmon critical habitat. As a result, only two activities (and resulting stressors) are likely to result in an adverse effect to Atlantic salmon critical habitat.

- Permanent movement migration barrier
  - Culvert replacements in tier 2 priority areas <= BFW

- Invert Line and slipline culvert rehabilitation in tier 2 priority areas
- Culvert end extensions/resets
- Bridge scour countermeasures

- Permanent habitat/critical habitat alteration
  - Culvert end extensions/ resets
  - Bridge scour countermeasures

3.5 Section 5 - Additional Information for Projects Likely to Adversely Affect Atlantic salmon/critical habitat

For each of the adverse effects listed above, a zone of potential adverse affects must be defined. This zone may be smaller than the action area if effects that do not result in adverse affects have a greater affected area. The PBO contains information about how to calculate these zones for each effect. The PNF also describes what impact zones are needed for these calculations.

Turbidity and sedimentation

MaineDOT or MTA, as appropriate, has proposed to complete monitoring to better define the potential extent, duration, and intensity of turbidity releases during in water construction, since historically, minimal information exists in Maine on turbidity and sedimentation effects. When that information becomes available, it should further inform the development of the extent of those impacts.

The MAP assumes that turbidity releases can result in effects up to 1,000 feet downstream from the activity.

If the activity is a single point activity (e.g. pile removal), turbidity should be calculated from the pile driving location downstream. The PBO assumed that pile removal activities with a BMP in place (e.g. turbidity curtain) will have 25 square feet of impact per pile removal.

When calculating the effected zone from a full stream width cofferdam installation, the zone should cover from the upstream (US) cofferdam to 1,000 feet downstream of the downstream (DS) cofferdam. When unknown, it is reasonable to assume that cofferdams will be placed 30 feet upstream of the activity and 30 feet downstream of the activity. The linear extent should then multiplied by the BFW of the stream to predict the square footage of effects.

For example:

Distance between US and DS cofferdam=125 feet

Stream average width=10 feet

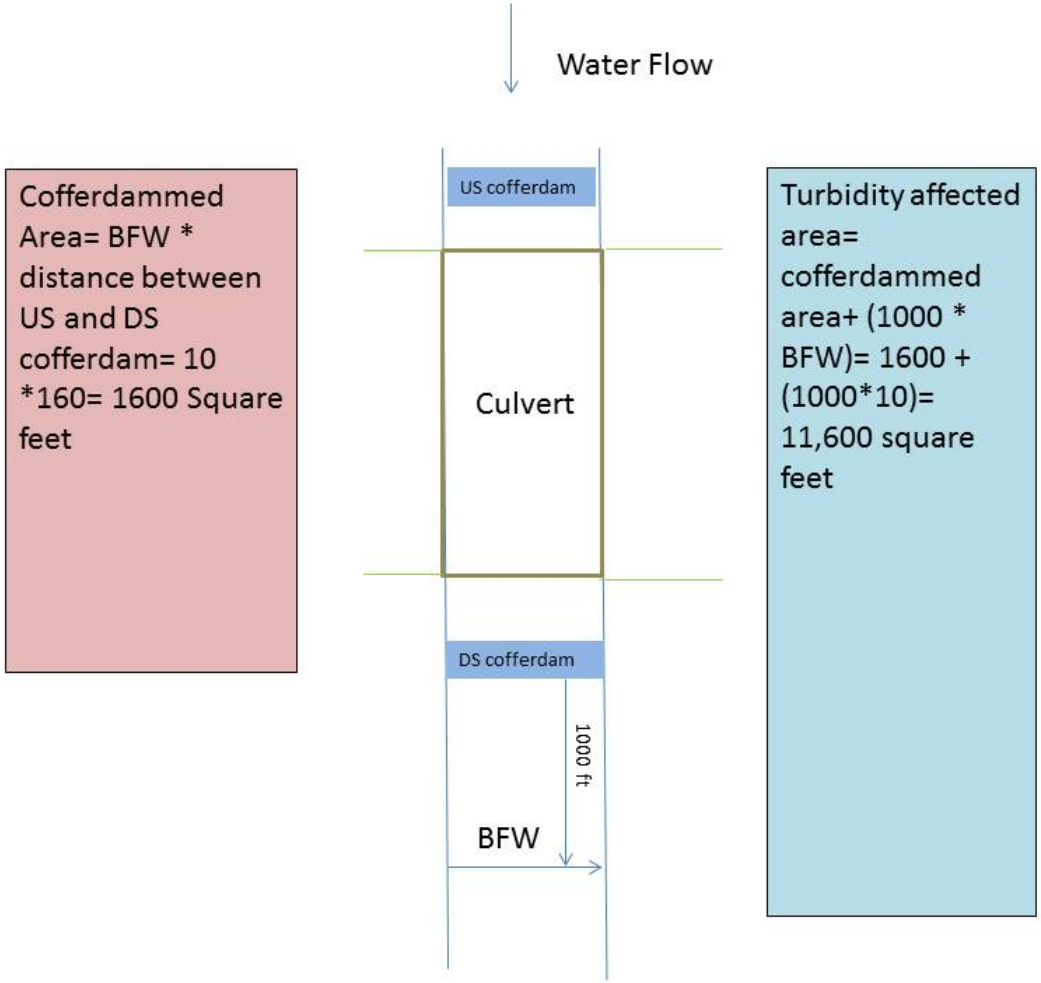
1125*10=11,250 square feet.

See Figure 1 below for a pictorial example.

Fish Handling/Stranding Area

When Atlantic salmon may be present in a project area, they may become trapped inside the cofferdam. Prior to the creating a dry work area, the MaineDOT, MTA, or otherwise authorized biologist will remove Atlantic salmon and other aquatic organisms from the cofferdammed area. The area of impact for both handling and stranding is determined to be the area between the upstream and downstream cofferdam. The distance between the cofferdams is multiplied by the BFW of the stream to develop a square footage. The User's recognize that stream widths are variable, particularly around road crossings. For consistency purposes, the BFW should be used as the stream width for the determination. See Figure 1 below for a pictorial example.

Figure 1-Example of area calculations



Underwater Noise

Underwater noise is highly influenced by site conditions, subsurface conditions, pile hammer type, and number of pile strikes. To preliminary predict the effected zones, the User must first gather the following information. Pile size under the PBA is restricted to a maximum size (AMM 36).

- Pile material

- Pile diameter /width
- Pile Hammer Type
- Approximate number of impact pile strikes required for installation

This information can be used to research known data sources for expected sound pressures from the pile driving.

NOAAs Greater Atlantic Regional Fisheries Office (GARFO) has created a spreadsheet to predict potential effects zones from pile driving. Their spread sheet also contains representative pile driving data from the Caltrans Bioacoustics manual (found at link below).

http://www.dot.ca.gov/hq/env/bio/fisheries_bioacoustics.htm

From this published data source, the User must collect potential Peak Sound Pressure Level (SPL), the single strike sound exposure level (SEL) and Root Mean Squared (RMS) SPL for the expected pile size and type.

MaineDOT has completed hydro acoustic monitoring on multiple projects but has not developed a comprehensive database for expected noise from pile driving activities. If the Users would like to use data from a past project for effect zone prediction, it should be coordinated with the Service prior to submittal of the PNF.

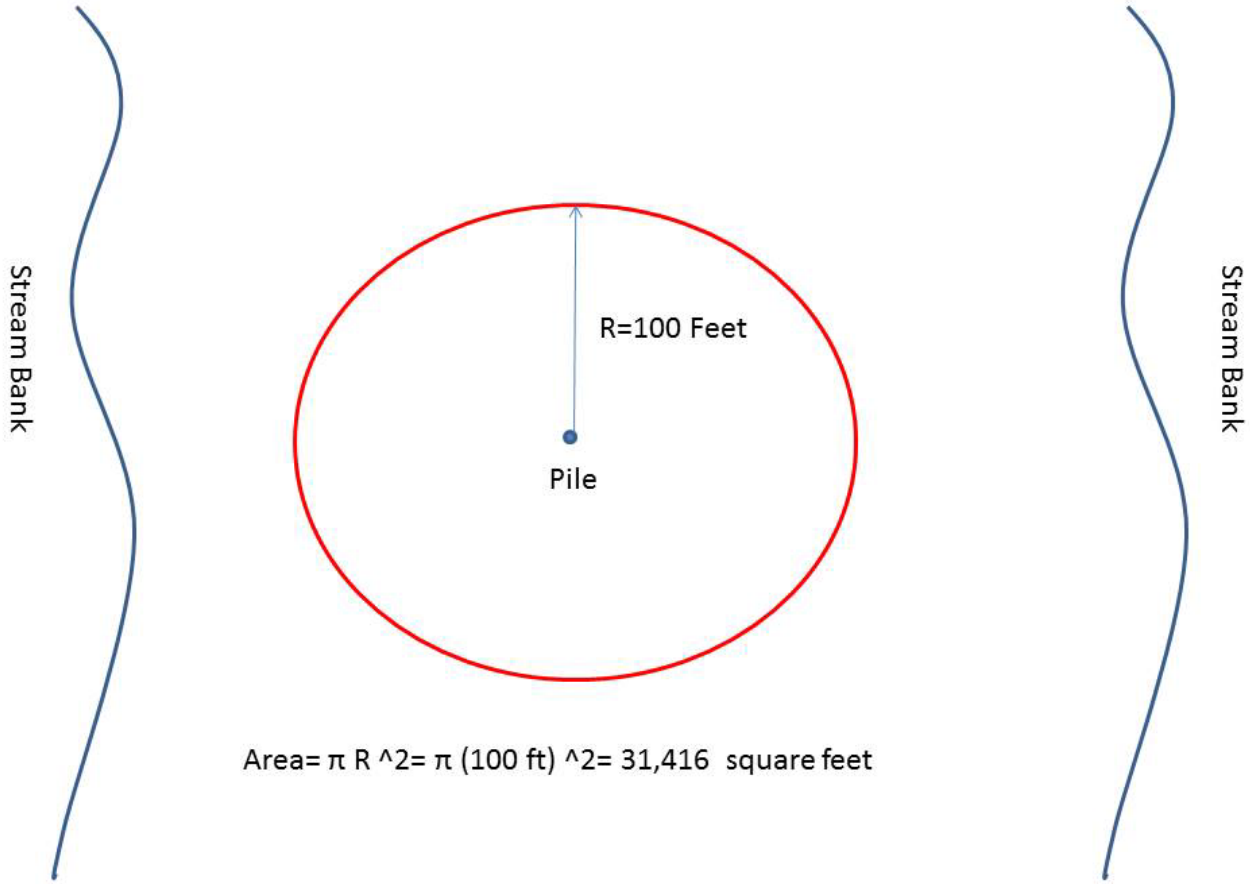
http://www.dot.ca.gov/hq/env/bio/fisheries_bioacoustics.htm

The consultation used the injury guidelines set forth in the Fisheries Hydroacoustic Working Group agreement (2008). Injury may potentially occur if noise limits reach 206 dB Peak or greater at 10 Meters from the pile. Injury may also potentially occur if the cumulative sound exposure limit is greater than 187 dB at 10 meters from the pile. The cSEL should be calculated over a 12 hour period. The cSEL standard is for fish larger than 2 grams. Hydroacoustic effects to Atlantic salmon smaller than 2 grams are not included in MAP.

Using the six points of data collected from the above resources, the User can use the NMFS pile driving calculator found at the link below to calculate the distance from the pile driving event injury can potentially occur.

The User must then take those distances and calculate an area of expected effects. These area calculations may need to be completed in two different ways. If the distance to injury around the pile is not expected to hit a feature that will attenuate the noise (stream bank, exposed gravel bar, etc.), then the distance can be treated as the radius of a circular zone of impact and the area can be calculated using $\pi * radius^2$. See Figure 2 below.

Figure 2-Example of hydroacoustic impact extent calculation without limiting factors



If the potential injury zone encounters a limiting factor (such as a stream bank, exposed gravel bar, etc.), then the affected area should be calculated as a rectangle. The edge of each side of the rectangle would be a stream bank or other factor. Any edges that do not contact a limiting factor will be placed at the predicted distance away from the pile driving. See Figure 3 below.

Figure 3-Example of hydroacoustic extent calculation with limiting factors

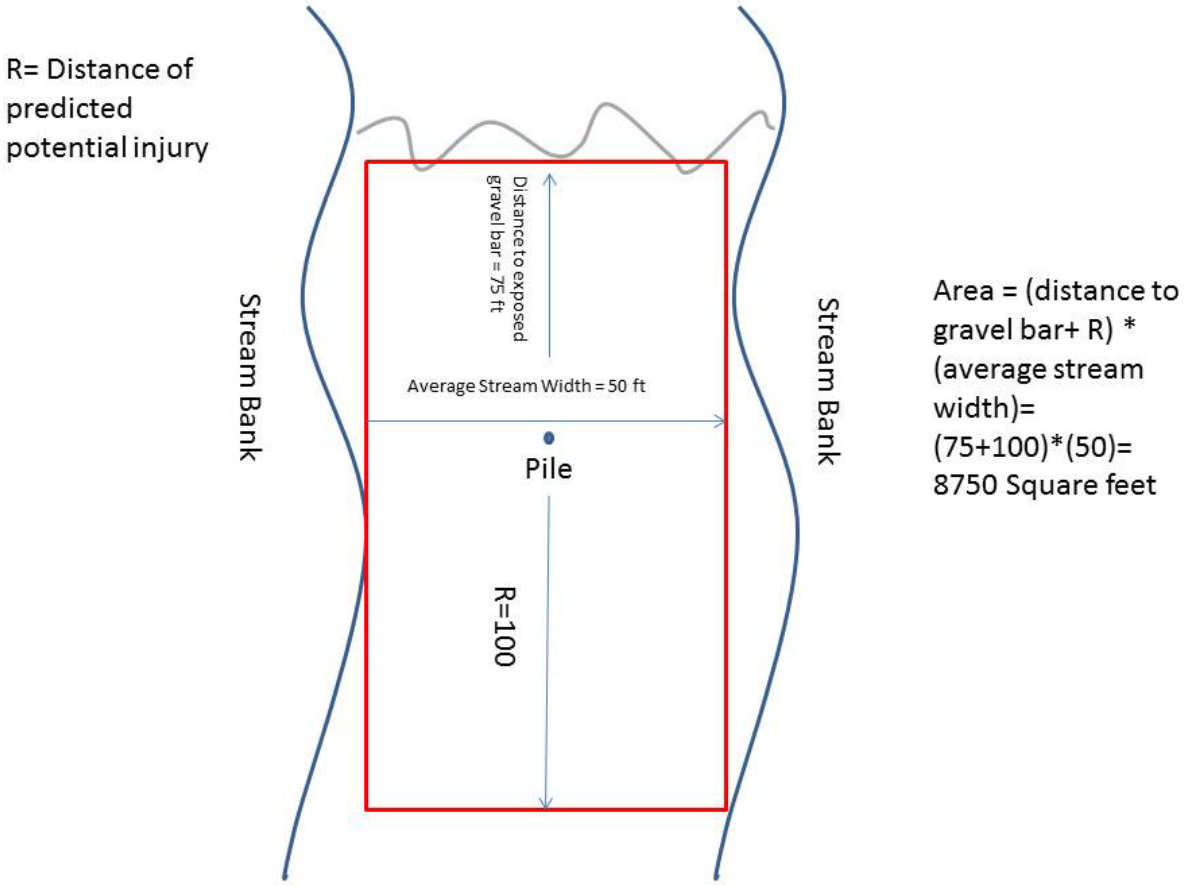


Table 1-Example table to complete hydroacoustic calculations

Pile Diameter (inches)	Pile Type	Pile Hammer Type	Number of expected impact strikes

Potential Peak SPL Distance (feet) over 206 dB Peak	Area of potential injurious noise (square feet)	Potential Cumulative SEL distance (feet) over 187 dB	Area of Potential injurious noise over 187 dB SEL	Potential RMS SPL Distance (feet)	Area (square feet) of potential behavioral effects over 150 dB RMS

Habitat alteration

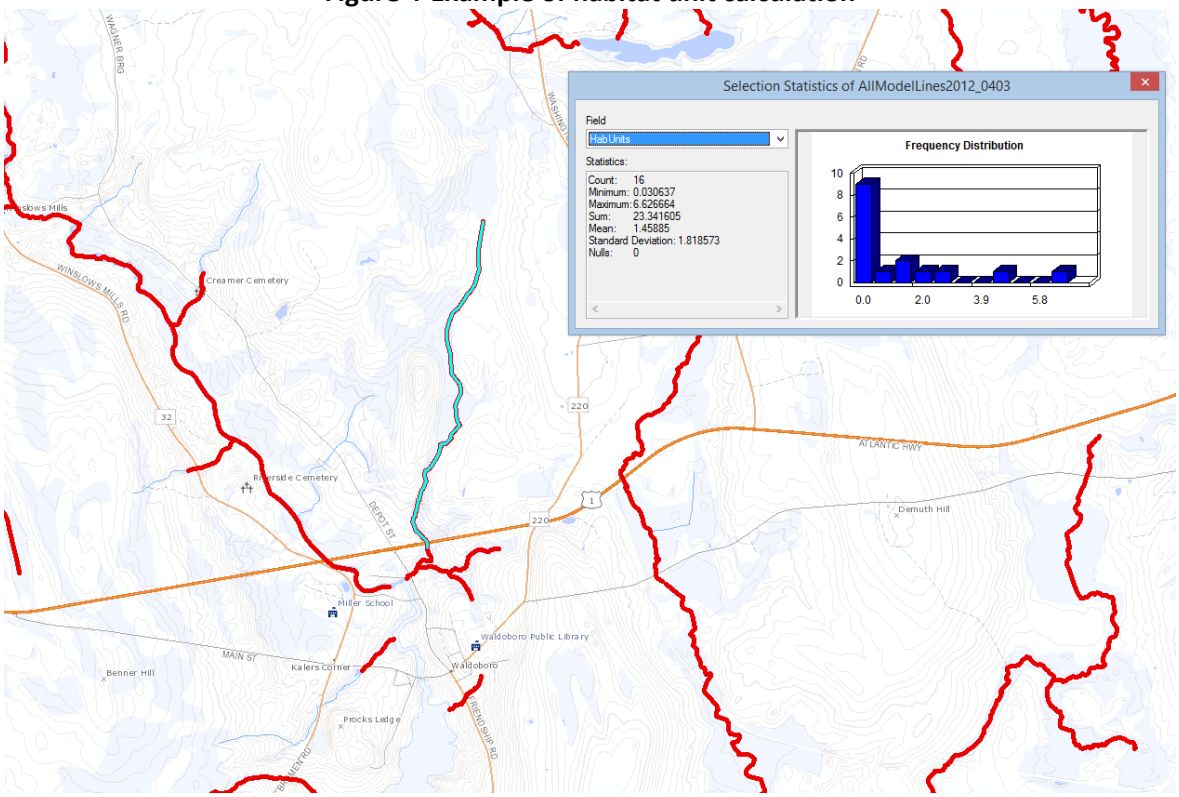
The MAP determined that some activities would result in adverse effects to habitat even after the proposed AMMs are implemented. In these cases, the extent of the impact is equal to the square footage of impact expected from the project.

Permanent Movement and Migration Barriers

Some activities result in fish movement and migration barriers. The upstream extent of this impact will be reported in habitat units. In order to calculate the habitat units upstream of a crossing, the modeled units from the Service Atlantic salmon habitat model should be used.

The habitat model is available as a shapefile. Users are expected to be able to select all of the stream extent upstream of a crossing represented by the habitat model. The User can then sum up the predicted values of habitat units to develop the total units affected.

Figure 4-Example of habitat unit calculation



Water Quality (increased pH)

Grout bag repairs that occur in lower stream flow (approximately one foot per second or less) will utilize a turbidity curtain to contain the work area. Though the turbidity curtain is an AMM, it also potentially could entrap Atlantic salmon and expose them to high levels of pH. To determine the potential area of adverse effects from pH, the User must determine the area that will be potentially enclosed with the turbidity curtain.

4 Excluded Activities

The Description of the proposed action includes a general description of all types of transportation activities. If any of the applicable AMMs cannot be implemented for a specific project, then that project cannot be covered under the MAP. If applicable mitigation commitments can not be met (conservation measure 2 from PBA), then that project cannot be covered under the MAP. Actions that have potential effects on portions of the Atlantic salmon life cycle and habitat elements such as eggs, alevin, fry, or smolts; and spawning habitat, are excluded from the MAP due to the unpredictability of the effects in these highly sensitive areas. The proposed action and AMMs are designed to avoid these effects:

1. Disturbance (e.g. turbidity, acoustic, or other direct effects) in spawning areas during spawning and egg incubation periods (November-April).
2. Directly affecting spawning habitat with no restoration.
3. Potential delay to the seaward migration of smolts.
4. New transportation facilities that are longer than 0.5 mile.
5. Effects on adult Atlantic salmon in holding pools.
6. Culvert extensions greater than eight feet total at upstream and/or downstream ends of culverts in Tier 1 and Tier 2 priority areas.
7. Causeways placed in or near potential spawning habitat.
8. Invert line and slipline projects in Tier 1 areas.
9. Underwater blasting where Atlantic salmon could be present.

5 Standard Operating Procedure for Site-Specific Project(s) Submission

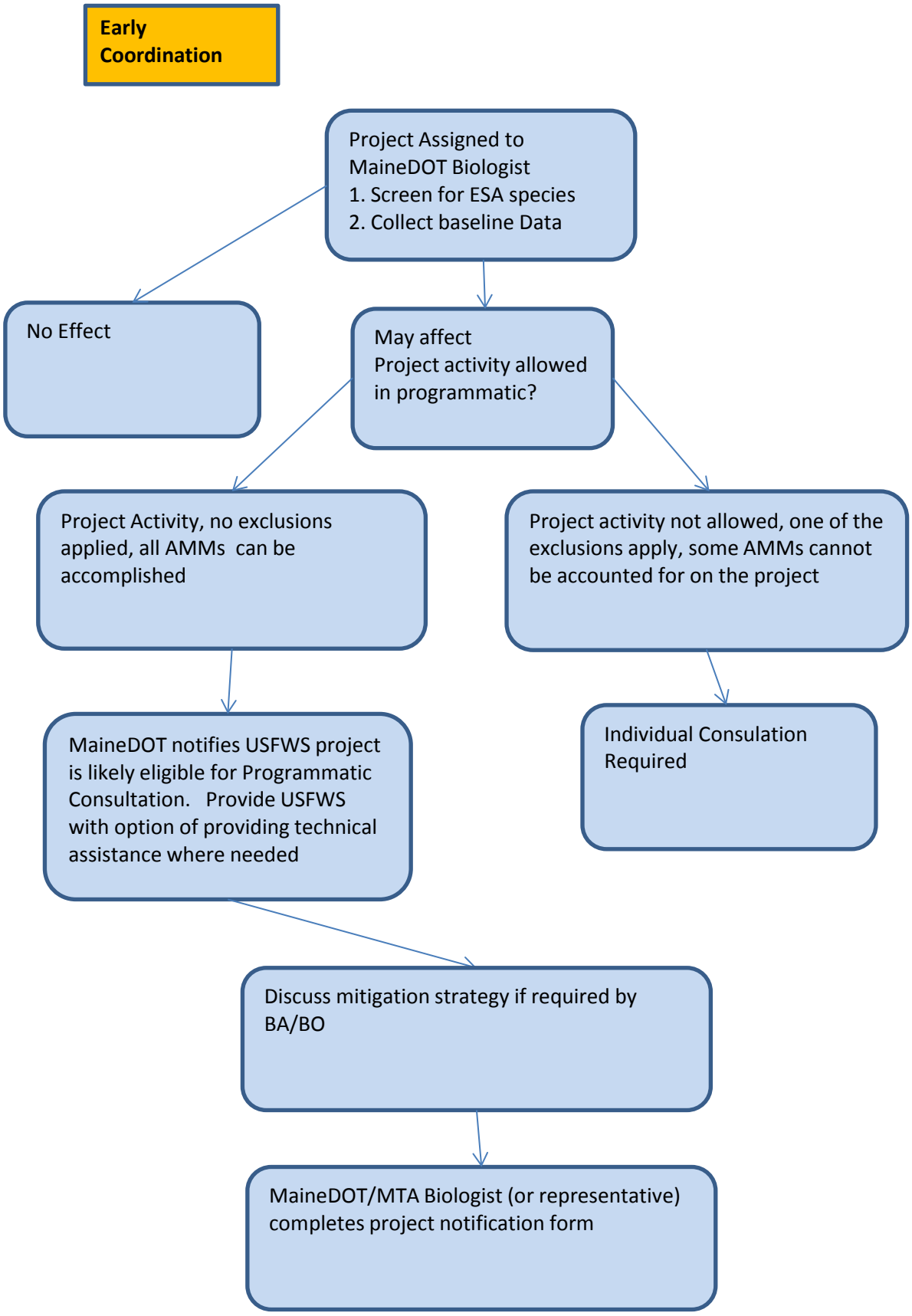
Please use the following procedure to submit site specific transportation project(s) for inclusion in the MAP and to record project specific information.

5.1 Early Coordination

Early coordination on projects that will seek programmatic coverage is important to ensure efficient processing of projects under the MAP.

MaineDOT biologists that are assigned to potentially eligible projects will work to guide the project to meet the MAP from a very early stage. Typically this takes place significantly before the PNF will be filled out. Please see Figure 5 below for guidance on the early coordination process. MaineDOT biologist will also coordinate with USFWS to help guide projects to meet the MAP.

Figure 5- Early Coordination Process Outline



5.2 Project Notification

Step 1-Begin Notification/Submittal Process

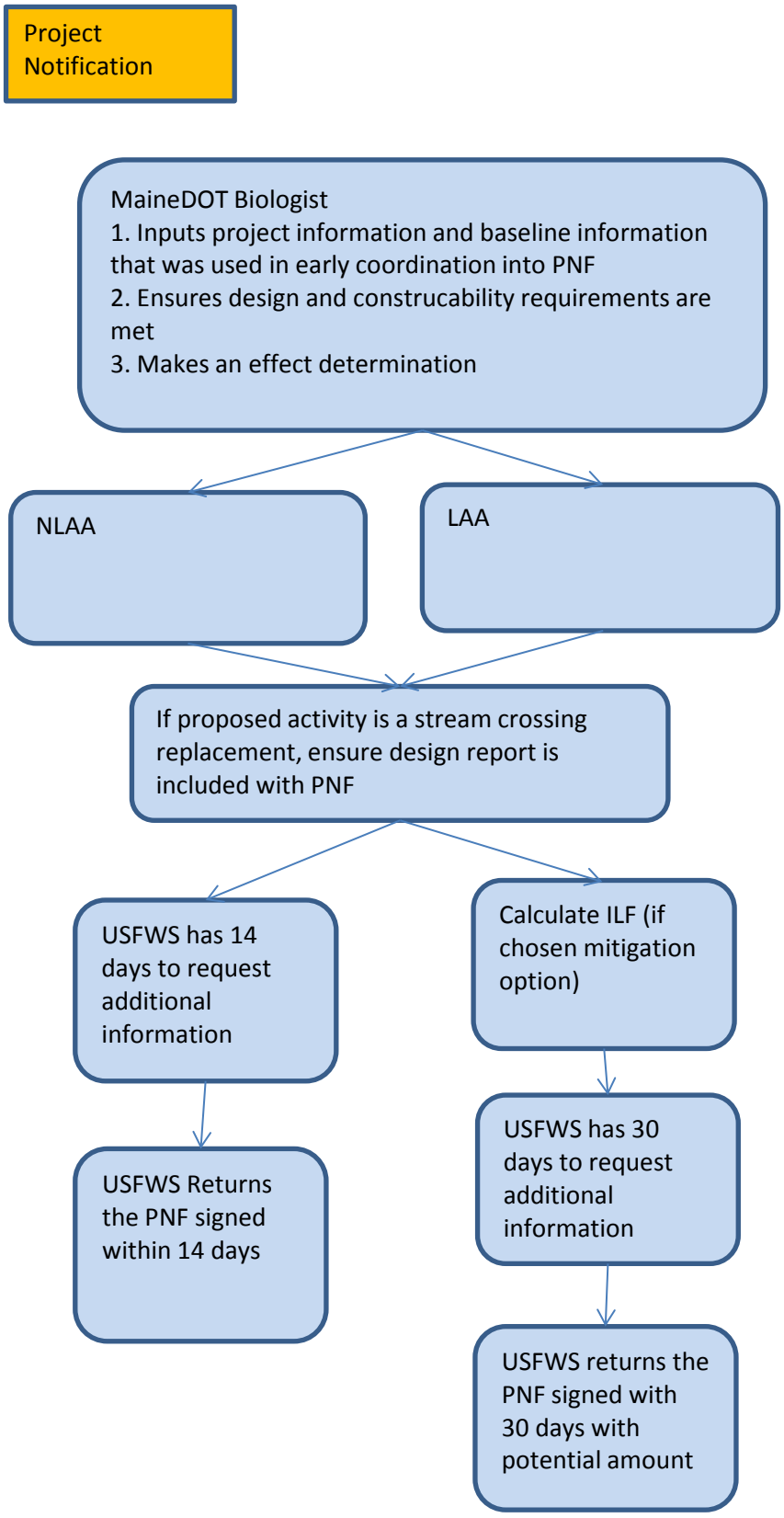
To begin this step, the applying transportation agency will go to the Information for Planning and Conservation (IPaC) website at http://ecos.fws.gov/ipac/ and follow these steps:

After an initial email confirmation that the request has been submitted, the transportation agency contact will receive a follow-up email with an attached official species list, an attached shapefile of the action area, the appropriate Service Field Office contact(s) information, and the consultation code(s) associated with the species list.

Step 2–Determine Adherence to Scope and Submit PNF

The transportation agency will determine whether or not the proposed action adheres to the scope and criteria of the MAP. If so, unless the effect determination is a "no effect", the transportation agency shall submit a PNF, which includes the identification of AMMs and if applicable, compensatory mitigation measures required to offset adverse effects on the Atlantic salmon or its Critical Habitat, to the email addresses of the appropriate Service Field Offices. Please see Figure 6 below for guidance on the project notification process.

Figure 6- Project Notification Process



5.3 Stream Crossing Replacement–Design Review

During the development of the PBA, the techniques and review of information for habitat connectivity design were extensively discussed. The review procedures and the information that will be provided to the Service is a new process for the Users. Each project utilizing habitat connectivity design will submit preliminary information to the Service for review(14 day review for NLAA determinations and 30 day review for LAA determinations). Because section 7 consultation (or consistency review) must be completed prior to NEPA approvals, this information will not have final design detail. If the Service has comments on the design during the review, MaineDOT will respond to the comments and include them in the final design, if possible. The following information will be included in the preliminary design information

- Existing structure information
- Description of geomorphic conditions of the stream
- BFW
- Substrate Analysis Results (Pebble Count)
- Key pieces in reference reach expected to be incorporated into the design
- Longitudinal Profile
- Proposed Prelim Design
- Ensure meets hydraulic standard (structure 100 %) full at Q 100

5.3.1 When habitat connectivity cannot be accomplished and geomorphic design must be utilized

Habitat connectivity design (HCD) is the default for all stream crossing replacement projects (Activity 1). All efforts should be made to use that design concept for stream crossing replacement projects under the MAP. However, the situation does arise where disconnect in the profile around the road crossing is too great to overcome. In those instances, pre coordination with the Service is necessary prior to starting the PNF.

It is required that the Users provide the Service with the reasoning as to why HCD could not be accomplished.

The Users should provide a draft design to the Service at least 30 days prior to submittal of the PNF.

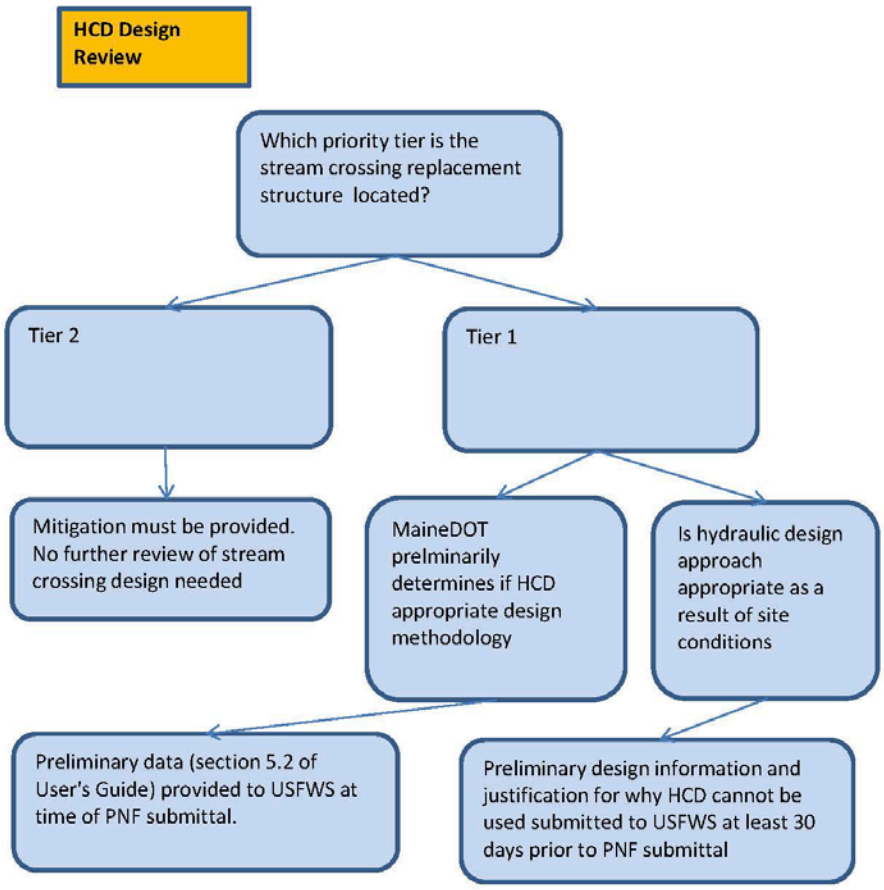
5.3.2 Coordination

Comments from the Service on the design should focus on things that the Users can accomplish in final design, while understanding that Users cannot provide final design details in response to their comments.

Table 2–Summary of design commitments for stream crossing replacements

Stream Crossing Replacement Location	Minimum Width (culvert or between bridge abutments)	Design	Mitigation
Tier 1	1.2 BFW	Habitat Connectivity Design	No
Tier 2	1.2 BFW	Habitat Connectivity Design	No
Tier 2	1.0 BFW	Embedded, backfilled, substrate can be hydraulically designed	Yes

Figure 7- Stream Crossing Design Review Process



5.4 Process for Lead Service Field Office

Upon receiving the PNF from a transportation agency, the Maine USFWS Field Office will update the project in the Tracking and Integrated Logging System (TAILS) using the consultation code(s) from the PNF. Each Service Field Office will follow their office's data entry procedures for TAILS.

5.5 Other Endangered Species

If consultation is required for other federally endangered or threatened species it should be noted in the PNF in Section 1. If the additional species require consultation with the same agency, the PNF will likely be attached to the request for concurrence or biological assessment submitted for effects on that species.

6 Urgency Projects

For the MAP; MaineDOT or MTA will confer with the FHWA or ACOE to determine whether an urgency declaration will be made. Following that, MaineDOT or MTA will contact the Service by telephone or email to notify the Service that an urgency declaration has been made. Projects submitted as urgent should be infrastructure that is in ***immediate*** danger of failing and becoming a traffic hazard or safety concern. MaineDOT or MTA will subsequently submit the PNF that will be developed as part of the User's Guide. The Service will respond in writing via e-mail within two business days of the receipt of the request to proceed. Due to the timely response needed to carry-out urgency projects, the standard in-water work window (AMM #1) will not apply to urgency projects. However, whenever practicable, urgency projects will try to meet the goal of working within the standard in-water work window as much as possible. Urgency projects will meet the activity requirements in the MAP except for any timing restrictions (unless practicable), and the Service will conduct an expedited review as compared to other activities covered under the MAP.
Following completion of the urgency project, MaineDOT or MTA, as appropriate, will submit a report detailing the construction. The report will include photographs, report of any Take, a summary of how the AMMs were applied, and detail any post-project monitoring required.

7 Project Change Notification

Project Notification Forms will be submitted prior to NEPA approvals when projects are still in the preliminary design phase. Inevitably, changes in project scope will occur. A MaineDOT or MTA biologist, as appropriate, is required to review these changes. The ACOE and FHWA must be notified of any changes in scope. The necessary steps in this review and notification process are outlined below:

Step 1

Identify whether the project changes result in any changes to the activity or AMMs as they were stated in the original PNF. If there are no changes to the activity or additional AMMs required, no further notification is necessary. If there are changes to the activity or additional AMMs may be required, go to Step 2.

Step 2

If project changes result in changes to the activity, a new PNF must be filed with the updated changes. If new adverse effects are added, those extents must be calculated and provided to the Service and any appropriate

additional AMMs noted. If, after filling out the new PNF, the activity still meets the MAP, submit the PNF to the Service. If the activity no longer meets the MAP, go to Step 3.

Step 3

If project changes result in an action that no longer qualifies for MAP, the Service must be officially notified and effects from the action must be covered in a separate consultation.

8 Project Notification Form

Maine Atlantic Salmon Programmatic Consultation for Transportation Projects
Gulf of Maine Distinct Population Segment of Atlantic salmon, U.S. Fish and Wildlife Service Jurisdiction

SECTION 1: GENERAL PROJECT INFORMATION			
MaineDOT WIN:		**USFWS Consultation Code:**	
Lead Federal Agency:			
Lead Agency Contact Name:		Email:	
		Phone:	
Transportation Agency (MaineDOT/MTA):			
Lead Biologist Name:		Email:	
		Phone:	
Project Location			
Town:		Route # & Bridge #:	
Latitude (DD.ddd):		Longitude (DD.ddd):	
HUC-10 Watershed Name:		HUC-10 Watershed #:	
Waterbody:		Tier (see Section 2.5 in BA for Tier areas):	

	General Activity Category (check all that apply):
☐	**Stream Crossing Structure Replacement (define each):** ☐ Culvert Replacement (structure ≤20 feet) ☐ Bridge Replacement (structure >20 feet)
☐	**Bridge Removal (without replacement)**
☐	**Culvert End:** ☐ Extension ☐ Reset
☐	**Bridge Scour Countermeasure**
☐	**Bridge Maintenance** ☐ Grout Bag Installation ☐ Concrete Repair
☐	**Temporary Access**
☐	**Slipline/Invert Line**
☐	**Geotechnical Drilling**
☐	**Urgency Project**

Maine Atlantic Salmon Programmatic Consultation for Transportation Projects
Gulf of Maine Distinct Population Segment of Atlantic salmon, U.S. Fish and Wildlife Service Jurisdiction

Project Description:

Proposed In-water work window:	

Project Site Characteristics: Please note these characteristics may result in exclusions from Programmatic Consultation			
ATS Presence (attach additional info, such as correspondence if confirmed by an agency):			☐ Yes ☐ No
☐	Confirmed by USFWS/DMR/IFW/MaineDOT Data	Comment:	
☐	Project area is accessible to ATS, no data available		
☐	Downstream barrier		
☐ Eggs ☐ Alevin ☐ Parr ☐ Smolt ☐ Adult		Comment:	
Spawning Habitat Presence:		☐ Yes (If yes, refer to BO for additional requirements/exclusions) & AMMs 12, 13 ☐ No	
☐	Mapped	Date:	Comment:
☐	On-site survey	Date:	
Holding Pools Presence:		☐ Yes (If yes, refer to BO for additional requirements/exclusions) & AMMs 12, 13 ☐ No	
☐	On-site survey	Date:	Comment:
☐	DMR Coordination	Date:	
Clay Substrate Present:			

Early Coordination with USFWS:		☐ Yes ☐ No	
☐	Site Visit	Date:	Comment:
☐	Monthly Meeting	Date:	
☐	Email Correspondence	Date:	

Will the project result in beneficial impacts?		☐ Yes ☐ No
	Number of Upstream Habitat Units Restored with Stream Crossing Replacement or Removal:_____	Comment:
	Other:	

Action Area Extent
Comment:

Other federal endangered species in project area: If there is an effect to any of the below species or their designated critical habitat, a separate consultation request will be prepared. This notification form will be attached to that consultation request. If the consultation request will utilize separate programmatic consultations, both reporting forms will be packaged together.	
Canada Lynx or its designated critical habitat	
Consultation : ☐ Required ☐ Not Required	
Lead Federal Agency Determination: ☐ No Effect ☐ Individual Consultation	Comment:
Northern Long-Eared Bat	
Consultation Status: ☐ Required ☐ Not Required	
Lead Federal Agency Determination: ☐ No Effect ☐ Streamlined 4(d) Consultation ☐ FHWA Programmatic Consultation	Comment:
Rusty-Patched Bumblebee	
Consultation : ☐ Required ☐ Not Required	
Lead Federal Agency Determination: ☐ Project is outside of potential range ☐ No Effect ☐ Individual Consultation	Comment:
Rufa Red Knot	
Consultation : ☐ Required ☐ Not Required	
Lead Federal Agency Determination: ☐ Project is outside of potential range ☐ No Effect ☐ Individual Consultation	Comment:
Are there any other federally listed species potentially affected by the Project?	
☐ No	

☐ Yes	Comment (List species and attach additional relevant information):

SECTION 2: GENERAL ACTIVITY CATEGORY DESIGN REQUIREMENTS

(Check larger section heading if activity is proposed; confirm that design requirements for each activity will be met by checking sub boxes). AMMs are summarized to include general topic and applicability.

☐	**Stream Crossing Structure Replacements**
Tier 1	
	Minimum span 1.2 x BFW with Habitat Connectivity Design* **If Habitat Connectivity Design cannot be used, Hydraulic Design may be eligible for programmatic consultation, but it requires early coordination with and approval by USFWS prior to submittal of Project Notification Form.*
Tier 2	
	Minimum span 1.2 x BFW with Habitat Connectivity Design
	Minimum span 1.0 x BFW with Hydraulic or Habitat Connectivity Design **with Mitigation** [AMM 59]
Additional Design Requirements for Rearing and Spawning Areas	
	Rearing Habitat Present Bridge Replacements (piers and abutments) will not result in a net increase in in-water structure footprint [AMM 46]
	Spawning Habitat Present Bridge Piers and abutments will not be placed in ATS spawning habitat [AMM 46]

☐	**Bridge Removal (without replacement)**
	In-water portions of the bridge will be completely removed or cut flush below the substrate
	Are constructability assumptions in section 2.3.2 and Table 4 of BO applicable

☐	**Culvert End Extension (in Tier 1 or 2)**
	Extensions will not exceed 8 feet total length (includes both upstream and downstream) and **Mitigation is required [AMM 59]**
	Minimal or no stream re-alignment proposed
	AMM 52: - The width of the relocated channel will match that of the pre-existing width; - Channel depths will match that of the pre-existing stream section; - CSM will be placed along the bottom of the reconstructed stream channel to re-establish stream substrate; and - Riprap placement in the stream will be minimized to that necessary for erosion/scour prevention and embedded and covered with natural substrate material.

☐	**Culvert End Resets**
	No stream re-alignment necessary

☐	**Bridge Scour Countermeasures**
	AMM 44: Cable mats used for scour protection will be backfilled with a gravel-like material between the voids. Any larger stones or streambed material excavated for the placement of the mats will then be distributed on top of the countermeasures.
	AMM 61 : - Cable mats will be installed to match the existing channel contours; -A low flow channel will be added to allow adequate water depths (approximately 6 inches) during low flow periods; and - Stream bed material and large rocks (greater than 1 foot in diameter) will be placed randomly back on top of the scour countermeasures
	AMM 58: Mitigation proposed

☐	**Temporary Access**
	Temporary causeways will not be located in potential spawning habitat
	AMM 31- [fill] causeway will not extend across >25% of BFW of stream/ river

☐	**Slipline/Invert Line**
	Project is located in Tier 2 (slip/invert lines in Tier 1 areas not eligible for MAP [See AMM 48])
	Project will be designed to improve fish passage **AMM 47:** Project will include fish passage measures in the design. Fish passage measures include weirs inside and outside of the crossing structures to ensure that water depths and velocities allow for fish passage at a range of flows.
	AMM 60: Mitigation required

Will any new roads longer than 0.5 miles in length be created as part of the action?		
	Yes [project is not eligible for MAP–See AMM 11 for explanation]	Comment:
	No	

SECTION 3: CONSTRUCTABILITY REQUIREMENTS

(Check larger section heading if activity is proposed; confirm that design requirements for each activity will be met by checking sub boxes). AMMs are summarized to include general topic and applicability. Refer to Appendix A of PBO or PBA for complete language for AMMs. Items in blue indicate requirements that may be different than standard specifications or contract requirements and need to be confirmed during preliminary constructability review prior to submitting PNF.

☐	**A. In-water work window**	
	AMM 1: July 15 –September 30	
	AMM 2: July 15- April 15 Bridge Replacement > 20 feet and spawning areas not present	
	AMM 12: May 1-September 30 Bridge Replacement > 20 feet and spawning areas present No turbidity, noise, direct effects, during spawning and egg incubation between October 1-April 30	
	Other	
	Geotechnical Drilling (no temporary access)	
	Pile removal with turbidity curtain	
	Special circumstances with no ATS Presence USFWS Early Coordination and approval received prior to submittal of Project Notification Form	Comment:

☐	**B. Cofferdams and Bypass Systems**
	Cofferdam(s) are required for the activities below. See User's Guide for Additional Guidance.
	AMM 4: All in-water excavation will be conducted within a cofferdam
	AMM 17: All in-stream work will take place inside of a cofferdam except: pile driving, clean riprap placement for temporary causeways, bridge pier demolition, and geotechnical drilling
	AMM 49: ATS presence expected. Abutment demolitions with a hoe ram will occur inside of a dewatered cofferdam [or outside of the water].
	AMM 15: In streams with clay substrate, activities that disturb the substrate will be conducted inside of a sealed cofferdam.

If Cofferdams and Bypass Systems are required, the following AMMs also apply:

	AMM 18: Suspended sediment treatment will follow the procedures described in Section 3.4.2 of the PBA "Dirty Water" Treatment System.
	AMM 19: For activities requiring bypass pumping in streams, stabilization techniques (such as sheets of poly) will be used to protect the stream from scour caused by the high water velocity coming from the hose(s) at the downstream end.
	AMM 20: Temporary bypass systems will utilize non-erosive techniques, such as pipe or a plastic-lined channel that will accommodate the predicted peak flow rate during construction. These are reviewed as part of the contractor's SEWPCP. Predicted peak flows are provided to the contractor in the bid documents; these values are derived from the USGS regression (USGS 2015).

	AMM 22: All cofferdams will be fully removed from the stream immediately following completion of in-water work, minimizing delays due to high stream flows following heavy precipitation, so that fish and aquatic organism passage are not restricted any longer than necessary. If a project is not completed and there will be substantial delays in construction, cofferdams will be at least partially removed to allow passage of Atlantic salmon until construction resumes. All areas of temporary bottom disturbance will be restored to their original contour and character upon completion of the project.
	AMM 23: All cofferdams will be removed using techniques to minimize turbidity releases. This includes allowing for the slow reintroduction of water into the work area and utilizing dirty water treatment systems for turbid water.
	AMM 24: Bypass pumps will be sized according to the expected flows during construction. See Section III(F)3 in the MaineDOT BMP Manual (MaineDOT 2008) for guidance on pump capacity.
	AMM 29: ATS presence expected. MaineDOT or MTA environmental staff or similarly qualified consultants will capture and remove as many Atlantic salmon and other fish species as possible ("See Appendix G of User's guide). -Cofferdams have to be dewatered to less than 2 feet deep to facilitate Fish Evacuation. Differing conditions must be discussed with USFWS prior to submittal of the PNF.
	AMM 30: All intake pumps within fish bearing streams will have a fish screen installed, operated, and maintained. To prevent Atlantic salmon juvenile entrainment related to water diversions, the contractor will use a screen on each pump intake large enough so that the approach velocity does not exceed 6.10 meters per second (0.20 feet per second). Square or round screen face openings are not to exceed 2.38 millimeters (3/32 inch) on a diagonal. Criteria for slotted face openings will not exceed 1.75 millimeters (approximately 1/16 inch) in the narrow direction. These screen criteria follow those indicated by the NMFS (2008). Intake hoses will be regularly monitored while pumping to minimize adverse effects to Atlantic salmon.
	AMM 55: ATS presence expected. Cofferdams that span the entire channel will not be used for bridge scour countermeasure projects**.**

☐	**C. Temporary Causeway**
	AMM 6: Temporary causeways placed in the riparian area will be constructed in a manner that they do not allow erosion into resources during construction. This will be reviewed and approved as a part of the SEWPCP, including review of location as well as placing a nonerodible material on the surface of the causeway.
	AMM 31: Temporary causeways in stream channels will be constructed of non-erodible material, i.e., plain riprap or large riprap (per MaineDOT standard specifications) over geotextile fabric. Temporary causeways will extend to no more than 25% of BFW of the stream or river.

☐	**D. Pile Driving**
	General Pile Driving Requirements
	AMM 36: Round pile sizes will be less than 30 inches in diameter. H-pile size will be less than 14 inches
	AMM 37: A vibratory hammer will be used as much as possible for all pile driving activities.
	AMM 38: Pile driving will occur during the day
	Additional requirements for Pile Driving where ATS are present
	AMM 39: Hydroacoustic monitoring will be completed for all impact pile driving using the monitoring template developed by the Fisheries Hydroacoustic Working Group and following the methods described in the Technical Guidance (Caltrans 2015).
	AMM 40: A bubble curtain meeting the design criteria, as defined in the User's Guide, will be employed during all impact pile driving events.

☐	**E. Riprap**
	AMM 42: Permanent riprap placed in a stream below the bankfull elevation (Q1) will be covered by CSM.
	AMM 43: Riprap placed outside of a cofferdam must be cleaned prior to installation.

☐	**F. Grout Bag Installation/Concrete Repair**
	AMM 32: 1. Grout slurry will be applied at a rate of ~ two cubic yards per hour or less 2. Turbidity curtains will be used when practicable (in flows less than one foot per second 3. An anti-washout admixture (AWA) will be mixed with the grout prior to application 4. Grout will be piped into or behind grout bags
	AMM 33: As per Standard Specification 656.3.6 (e), the contractor will not place uncured concrete directly into a water body. The contractor shall not wash tools, forms, or other items in or adjacent to a water body or wetland.
	AMM 34: Prior to release to a natural resource, any impounded water that has been in contact with concrete placed during construction must have a pH between 6.0 and 8.5, must be within one pH unit of the background pH level of the resource and must have a turbidity level no greater than the receiving resource. This requirement is applicable to concrete that is placed or spilled (including leakage from forms) as well as indirect contact via tools or equipment. Disposal or treatment of water not meeting release criteria shall be addressed in the SEWPCP. Discharging impounded water to the stream must take place in a manner that does not disturb the stream bottom or cause erosion. The Contractor shall be responsible for monitoring pH with a calibrated meter accurate to 0.1 units. A record of pH measurements shall be kept in the Environmental Field Representative's log. Concrete being placed as a seal in a cofferdam for bridge pier construction is considered "impounded water".

☐	**G. Bridge Removal & Demolition**
	AMM 28, 35,49-51: See 2.3.2 and Table 4 of PBO (These are all constructability)
	AMM 49: Abutment demolitions with a hoe ram will occur inside of a dewatered cofferdam or outside of the water.
	AMM 50: If piles are removed by cutting, they must be cut to one foot below the substrate level.
	AMM 51: If a pile is pulled from the substrate, the work will be completed using a BMP specifically for minimizing turbidity, such as a turbidity curtain.

☐	**H. Underwater Blasting**
	Underwater Blasting is proposed only when ATS are not present. **AMM 41:** In-water blasting is not allowed when Atlantic salmon could be present.

☐	**I. Scour Countermeasure Cable Mats**
	AMM 44: Cable mats used for scour protection will be backfilled with a gravel-like material between the voids. Any larger stones or streambed material excavated for the placement of the mats will then be distributed on top of the countermeasures.
	AMM 55: Cofferdams that span the entire channel will not be used for bridge scour countermeasure projects

☐	**J. Spawning areas**
	AMM 13: Spawning habitat may be affected temporarily during construction (outside of October 1-April 30; see AMM 12) and will be restored.

☐	**K. Clay Substrates**
	AMM 15: In streams with clay substrate, activities that disturb the substrate will be conducted inside of a sealed cofferdam.

SECTION 4: EFFECTS DETERMINATIONS			
Potential Effects to Atlantic salmon:	**LAA**	**NLAA**	**Comments**
Elevated Turbidity and Transport	If ATS are present: ☐Cofferdam Installation ☐Bypass Channel Installation ☐Pile installation and Removal	☐	
Temporary Migration/Movement Barrier	If ATS are present: ☐ Cofferdam Installation ☐ Bypass channel installation ☐ Pier abutment demolition	☐	
Permanent Migration/Movement Barrier	If ATS are present: ☐ Invert line/slipline ☐ Culvert Extensions	☐	
Fish Handling and Relocation	☐ If ATS are present	☐	
Impingement/Entrainment		**X always**	
Water Quality Impact (pollutants)	If ATS are present: ☐ Grout Bag Installation	☐	
Habitat Alteration	If ATS are present: ☐ Slipline/Invert line ☐ Scour Countermeasures ☐ BFW Culverts in Tier 2 ☐ Riprap not covered with CSM (inlet/outlet stabilization on Stream Crossing Replacements)	☐	
Underwater Noise	If ATS are present: ☐ Pile Installation with an impact hammer ☐ Abutment/pier demolition a hoe ram	☐	

PBF Element [Defined in Section 5.2 of Biological Opinion]:	LAA	NLAA*	Comments
SR 1		☐	
SR 2, 3		☐	
SR 4, 5, 6, 7	☐ Slipline/Invert line ☐ Scour Countermeasures ☐ BFW Culverts in Tier 2 ☐ Culvert end extensions/resets	☐	
M1		☐	
M2		☐	
M3		☐	
M4		☐	
M5		☐	
M6		☐	

*If design criteria, exclusions, and AMMs as laid out in the MAP are followed, all activities covered by MAPSwill result in NLAA to Critical Habitat.

Final Effect Determination Atlantic salmon	☐ **LAA**	☐**NLAA**
Final Effect Determination Atlantic salmon Critical Habitat	☐ **LAA**	☐**NLAA**

SECTION 5: ADDITIONAL INFORMATION FOR PROJECTS LIKELY TO ADVERSELY AFFECT ATS/CH		
Data Required to Develop Incidental Take Statement (ITS)		
	SF	**BO Reference/Guidance on Calculation Area**
Geographic Areas of Adverse Effects to ATS- See User's Guide for Guidance on developing these areas. -Turbidity/Sedimentation Impacts (sf); Section 5.1.1 BO -Fish Handling (size of cofferdammed area) (sf); Section 5.1.4 -Underwater Noise (injury zone) (sf) Section 5.1.2 -Habitat Alteration (direct permanent impacts) (sf) Section 5.1.7 -Permanent Movement/Migration Barriers (US Habitat Units) Section 5.1.8 -Water Quality (Elevated pH zone) (sf) Section 5.1.6 -Temporary Migration/Movement Barrier (no geographic area required, See Section ___ of BO) Section 5.1.3		

Additional Submittals	
	Stream Crossing Replacement Design Report (required for all Stream Crossing replacements)
	In-lieu Fee Calculation Worksheet
	Photos

SECTION 6: SIGNATURES & AUTHORIZATIONS

The MaineDOT biologist signature represents acknowledgement that this form was filled out using the best available scientific and commercial information. It also shows acknowledgement that the best preliminary project scope information.

MaineDOT Lead Biologist

Signature_____ Date_____

The USFWS biologist signature acknowledges submission of the PNF is consistent with the MAP.

USFWS Biologist

Signature_____ Date_____

Website for current version of form

Form last revised by User_____

Appendix A–List of Avoidance and Minimization Measures (AMMs)

Appendix A–Avoidance and Minimization Measures

The AMMs listed in Appendix A are primarily instituted during construction in order to avoid and minimize impacts to Atlantic salmon and critical habitat. All elements of any activity will comply with the MaineDOT's Standard Specifications (MaineDOT 2014, http://maine.gov/mdot/contractors/ publications/standardspec/). Additionally, all construction practices will follow the MaineDOT: Best Management Practices for Erosion and Sedimentation Control (MaineDOT 2008). These BMPs include many filtering and sedimentation control techniques. AMMs and BMPs are measures that are considered part of the proposed action. If an AMM is not indicated for a specific Tier priority area, it should be assumed it applies to all activities in all areas. A list of AMMs was initially proposed in the PBA, but some AMMs have since been modified or added, based on new information and for additional clarification, in coordination with the MaineDOT, the FHWA, and the Corps.

AMM 1–In-water work for all activities other than bridge replacement and geotechnical sampling without temporary trestles where Atlantic salmon are expected to be present will be conducted during the low stream flow period (July 15 to September 30).

AMM 2–All in-water work on bridge replacement (greater than 20 feet) projects (and associated sub-activities, e.g., pier installation, temporary access installation, as necessary) will occur between July 15 and April 15.

AMM 3–All areas of temporary waterway or wetland fill will be restored to their original contour and character upon completion of the project. Temporary fill includes fill that received authorization and fill that mistakenly enters a resource (i.e., from slope failures, accidental broken sandbag cofferdams).

AMM 4–All in-water excavation will be conducted within a cofferdam.

AMM 5–All areas of disturbed soil will be mulched and seeded with an approved native or noninvasive herbaceous seed mix following construction and/or planted with native woody vegetation and trees appropriate during the first available planting season. In areas where there is little to no slope and erosion and invasive species establishment is unlikely, the native woody vegetation on the site will be allowed to regenerate naturally.

AMM 6–Temporary causeways placed in the riparian area will be constructed in a manner that they do not allow erosion into resources during construction. This will be reviewed and approved as a part of the SEWPCP, including review of location as well as placing a non-erodible material on the surface of the causeway.

AMM 7–Vegetation rootstock will only be removed in those areas that are subject to permanent impacts. Replanting will be completed as necessary and feasible, but may not be possible in certain situations, such as permanent impact areas, roadway clear zone, or adjacent to or under bridges.

AMM 8–To minimize the spread of noxious weeds into the riparian zone, all off-road equipment and vehicles operating from existing open and maintained roads must be cleaned prior to

entering the construction site to remove all soil, seeds, vegetation, or other debris that could contain seeds or reproductive portions of plants. All equipment will be inspected prior to off-loading to ensure that they are clean.

AMM 9–During construction, any disturbed soils will be temporary stabilized with BMPs, such as straw mulch, plastic sheeting, erosions control mix, or other appropriate BMPs. Disturbed areas with erodible soil can include, but are not limited to, temporary storage piles, access ways, partially constructed slopes, etc.

AMM 10–The Proponents will hold a pre-construction meeting for each project with appropriate Environmental Field Representatives, other MaineDOT or MTA staff, and construction crew or contractor(s) to review all procedures and requirements for avoiding and minimizing effects to Atlantic salmon and to emphasize the importance of these measures for protecting Atlantic salmon and its critical habitat. The Corps, the FHWA, and the Service staff will be notified and attend these meetings as practicable.

AMM 11–The Proponents are not proposing to include any new road facilities in this PBA. A new road facility will be defined as the creation of a new road longer than 0.5 mile in length. The new creation can include new connections and realigned portions of intersections with new inputs. Highway relocations and realignments are not considered a new road facility if drainage patterns are not altered and drainage remains within the same watershed as the previous highway portion.

AMM 12–The Proponents will not affect (turbidity above background, acoustic, direct effects) spawning areas during spawning and egg incubation periods (October 1 to April 30).

AMM 13–The Proponents will not temporarily affect spawning habitat without restoration.

AMM 14–No heavy construction equipment will travel into or through any flowing streams with erodible substrate (e.g., sand, silt, and clay). Travel of heavy construction equipment into or through flowing streams and on stream substrate will only occur when the stream substrate is non-erodible (e.g., ledge, cobble) and the contractor has received approval from the MaineDOT or the MTA environmental field office staff.

AMM 15–No activities that disturb the substrate will be conducted in streams with clay substrates that include in-water work outside of a sealed cofferdam. This is due to the unpredictable nature of undesirable effects.

AMM 16–The Proponents will require any work being completed under this programmatic consultation to submit a SEWPCP for review and approval of the MaineDOT or the MTA staff prior to the start of work. The plan includes the review of the implementation of any AMMs proposed.

AMM 17–The installation of cofferdam systems encloses a work area and reduces sediment pollution generated from construction work. All in stream work will take place inside of a cofferdam except for the following sub activities: pile driving, clean riprap placement for

temporary causeways, bridge pier demolition, and geotechnical drilling. In-water work in streams with a clay substrate will not occur outside of a sealed cofferdam.

AMM 18–Suspended sediment treatment will follow the procedures described in Section 3.4.2 of the PBA "Dirty Water" Treatment System.

AMM 19–For activities requiring bypass pumping in streams, stabilization techniques (such as sheets of poly) will be used to protect the stream from scour caused by the high water velocity coming from the hose(s) at the downstream end.

AMM 20–Temporary bypass systems will utilize non-erosive techniques, such as pipe or a plastic-lined channel that will accommodate the predicted peak flow rate during construction. These are reviewed as part of the contractor's SEWPCP. Predicted peak flows are provided to the contractor in the bid documents; these values are derived from the USGS regression (USGS 2015).

AMM 21–Sheet pile driving (if utilized) will be completed using a vibratory hammer.

AMM 22–All cofferdams will be fully removed from the stream immediately following completion of in-water work, minimizing delays due to high stream flows following heavy precipitation, so that fish and aquatic organism passage are not restricted any longer than necessary. If a project is not completed and there will be substantial delays in construction, cofferdams will be at least partially removed to allow passage of Atlantic salmon until construction resumes. All areas of temporary bottom disturbance will be restored to their original contour and character upon completion of the project.

AMM 23–All cofferdams will be removed using techniques to minimize turbidity releases. This includes allowing for the slow reintroduction of water into the work area and utilizing dirty water treatment systems for turbid water.

AMM 24–Bypass pumps will be sized according to the expected flows during construction. See Section III(F)3 in the MaineDOT BMP Manual (MaineDOT 2008) for guidance on pump capacity.

AMM 25–No equipment, materials, or machinery will be stored, cleaned, fueled, or repaired within any wetland or watercourse. All vehicle and equipment refueling activities will occur more than 100 feet from any water course and if not, all refueling areas will require fuel spill containment structures as per the SPCC Plan. Other construction equipment maintenance will be done at a location consistent with SPCC Plan and in a manner that avoids hazardous materials getting into the stream.

AMM 26–All pumps and generators will have appropriate spill containment structures and/or spill remediation materials available, such as absorbent pads.

AMM 27–All equipment used for in-stream work will be cleaned of external oil, grease, dirt, and mud such that turbid water does not drain to any wetland or watercourse. Any leaks or accumulations of these materials will be corrected before entering streams or areas that drain

directly to streams or wetlands. All releases into surface waters or wetlands will be reported immediately to the appropriate regulatory body.

AMM 28–Any removed piling or other demolition material will be properly disposed of at a location in compliance with applicable regulatory approvals.

AMM 29–To minimize fish stranding inside the cofferdam when dewatering, the MaineDOT or MTA environmental staff or similarly qualified consultants will capture and remove as many Atlantic salmon and other fish species as possible. The MaineDOT or MTA environmental staff or similarly qualified consultants will inspect the cofferdams after placement for presence of adult Atlantic salmon. If adult Atlantic salmon are observed during active construction, all activities will cease and the MaineDOT or MTA environmental staff or similarly qualified consultants will immediately contact the Service's Maine Fish and Wildlife Complex 207/469-7300. The MaineDOT or the MTA environmental staff or similarly qualified consultants will complete a fish evacuation where water depths allow following the plan found in Appendix A of the BA. As stated in Appendix A, nets will be used to "herd" fish out of the work area to the extent practicable prior to electrofishing and cofferdam installation. This kind of fish exclusion measure can occur prior to cofferdam construction when water depths are less than <2 feet. Appropriate fish evacuation techniques in cofferdams are required for bridge pier construction. Water depths and access make these evacuations a unique situation. In these cases, the Proponents will provide project-specific fish evacuation plans to the Service prior to programmatic approval.

AMM 30–All intake pumps within fish bearing streams will have a fish screen installed, operated, and maintained. To prevent Atlantic salmon juvenile entrainment related to water diversions, the contractor will use a screen on each pump intake large enough so that the approach velocity does not exceed 6.10 meters per second (0.20 feet per second). Square or round screen face openings are not to exceed 2.38 millimeters (3/32 inch) on a diagonal. Criteria for slotted face openings will not exceed 1.75 millimeters (approximately 1/16 inch) in the narrow direction. These screen criteria follow those indicated by the NMFS (2008). Intake hoses will be regularly monitored while pumping to minimize adverse effects to Atlantic salmon.

AMM 31–Temporary causeways in stream channels will be constructed of non-erodible material, i.e., plain riprap or large riprap (per MaineDOT standard specifications) over geotextile fabric and will extend only to within 25 percent of the BFW of the stream or river.

AMM 32–The Proponents will employ the following procedure when completing grout bag repairs.

1. Apply the grout slurry at a rate of two cubic yards per hour to reduce the likelihood of elevated pH values downstream.
2. Turbidity curtains will be used when practicable (in flows less than one foot per second) to separate high pH water from the rest of the river.
3. An anti-washout admixture (AWA) will be mixed with the grout prior to application.
4. Grout will be piped into or behind grout bags.

AMM 33–As per Standard Specification 656.3.6 (e), the contractor will not place uncured concrete directly into a water body. The contractor shall not wash tools, forms, or other items in or adjacent to a water body or wetland.

AMM 34–Prior to release to a natural resource, any impounded water that has been in contact with concrete placed during construction must have a pH between 6.0 and 8.5, must be within one pH unit of the background pH level of the resource and must have a turbidity level no greater than the receiving resource. This requirement is applicable to concrete that is placed or spilled (including leakage from forms) as well as indirect contact via tools or equipment. Disposal or treatment of water not meeting release criteria shall be addressed in the SEWPCP. Discharging impounded water to the stream must take place in a manner that does not disturb the stream bottom or cause erosion. The Contractor shall be responsible for monitoring pH with a calibrated meter accurate to 0.1 units. A record of pH measurements shall be kept in the Environmental Field Representative's log. Concrete being placed as a seal in a cofferdam for bridge pier construction is considered "impounded water'.

AMM 35–Demolition and debris removal and disposal will comply with Section 202.03 of the MaineDOT's Standard Specifications. The Contractor will contain all demolition debris, including debris from wearing surface removal, saw cut slurry, dust, etc., and will not allow it to discharge to any resource. The Contractor will dispose of debris in accordance with the Maine Solid Waste Law (Title 38 M.R.S.A., Section 1301 et. seq.). The demolition plan, containment, and disposal of demolition debris will be addressed in the Contractor's SEWPCP.

AMM 36–Round pile size is limited to less than 30 inches in diameter. H-pile size is limited to less than 14 inches.

AMM 37–A vibratory hammer will be used as much as possible for all pile driving activities.

AMM 38–Pile driving will occur during the day when fish are less active and Atlantic salmon migrations are minimized.

AMM 39–Hydroacoustic monitoring will be completed for all impact pile driving using the monitoring template developed by the Fisheries Hydroacoustic Working Group and following the methods described in the Technical Guidance (Caltrans 2015).

AMM 40–A bubble curtain meeting the design criteria, as defined in the User's Guide, will be employed during all impact pile driving events. The bubble curtain design will mimic specifications for devices tested and employed for previous pile driving events.

AMM 41–In-water blasting is not allowed when Atlantic salmon could be present.

AMM 42–Permanent riprap placed in a stream below the bankfull elevation will be covered by CSM.

AMM 43–Any riprap that is placed in a stream that is not within a cofferdam will be cleaned prior to placement.

AMM 44–Cable mats used for scour protection will be backfilled with a gravel-like material between the voids. Any larger stones or streambed material excavated for the placement of the mats will then be distributed on top of the countermeasures.

AMM 45–The Proponents will not adversely affect Atlantic salmon adults sheltering in holding pools.

AMM 46–In Atlantic salmon rearing habitat, bridge replacements with piers and abutments will not result in a net increase of structure footprint. Piers and abutments will not be placed in Atlantic salmon spawning habitat.

AMM 47–All invert line and slipline projects will have fish passage measures included in the design. Fish passage measures include weirs inside and outside of the crossing structures to ensure that water depths and velocities allow for fish passage at a range of flows.

AMM 48–Invert line and slipline rehabilitation activities will not occur in Tier 1 priority areas.

AMM 49–Abutment demolitions with a hoe ram will occur inside of a dewatered cofferdam or outside of the water.

AMM 50–If piles are removed by cutting, they must be cut to one foot below the substrate level.

AMM 51–If a pile is pulled from the substrate, the work will be completed using a BMP specifically for minimizing turbidity, such as a turbidity curtain.

AMM 52–To minimize potential effects to fish passage with a culvert extension and stream realignment, design will ensure that:

1. The width of the relocated channel will match that of the pre-existing width;
2. Channel depths will match that of the pre-existing stream section;
3. CSM will be placed along the bottom of the reconstructed stream channel to re-establish stream substrate; and
4. Riprap placement in the stream will be minimized to that necessary for erosion/scour prevention and embedded and covered with natural substrate material.

AMM 55–Cofferdams that span the entire channel will not be used for bridge scour countermeasure projects.

AMM 56–Compensatory mitigation, through the ILF program or another mitigation approach that is part of the program, will be provided for all culvert end extensions occurring in Tier 1 and Tier 2 areas.

AMM 57–The Proponents are limiting culvert extensions under this programmatic to a total of eight feet.

AMM 58–Compensatory mitigation, through the ILF program or another mitigation approach that is part of the program, will be provided for all bridge scour countermeasures occurring in Tier 1 and Tier 2 areas.

AMM 59–Compensatory mitigation, through the ILF program or another mitigation approach that is part of the program, will be provided for all stream crossing replacements in Tier 2 areas that are greater than 1.0 times the BFW but less than 1.2 times the BFW.

AMM 60–Compensatory mitigation, through the ILF program or another mitigation approach that is part of the program, will be provided for all invert line and slipline projects in Tier 2 areas.

AMM 61–Bridge scour countermeasures will incorporate the following measures into project design:

1. Cable mats will be installed to match the existing channel contours;
2. A low flow channel will be added to allow adequate water depths (approximately 6 inches) during low flow periods; and
3. Stream bed material and large rocks (greater than one foot in diameter) will be placed randomly back on top of the scour countermeasures.

Literature Cited

Caltrans 2015. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Division of Environmental Analysis, Sacramento, California. November 2015. URL: *http://www.dot.ca.gov/hq/env/bio/files/bio_tech_guidance_hydroacoustic_effects_110215.pdf*; accessed December 28, 2016. 532 pp.

MaineDOT. 2008. Best Management Practices for Erosion and Sedimentation Control, Environmental Office, Augusta, Maine. February 2008. URL*: http://www.maine.gov/mdot/env/documents/bmp/BMP2008full.pdf*; accessed December 27, 2016. 199 pp.

MaineDOT. 2014. Standard specifications. Augusta, Maine. November 2014. URL: *http://maine.gov/mdot/contractors/publications/standardspec/docs/2014/StandardSpecification-full.pdf*; accessed December 27, 2016.

NMFS. 2008. Anadromous salmonid passage facility design. NMFS, Northwest Region, Portland, Oregon. URL: *http://www.westcoast.fisheries.noaa.gov/publications/hydropower/fish_passage_design_criteria.pdf*; accessed December 9, 2016.

Appendix B–Habitat Connectivity Design

Appendix B–Habitat Connectivity Design Protocol

Incorporated Design References

Culverts will be designed and constructed for consistency with natural stream dimensions, profiles, and dynamics, in accordance with the following technical references: U.S. Forest Service guide (Forest Service Stream-Simulation Working Group 2008), augmented by documents published by the states of Washington (Barnard et al. 2013), Vermont (Bates and Kirn 2009) and California (Love and Bates 2009).

Depending on site conditions, emulating natural stream conditions may not always be feasible. In these cases, the references may indicate the need for a geomorphic-based roughened channel design. The following considerations shall guide the use of this approach:

- geomorphically-based roughened channel designs shall generally be avoided and only be used when site conditions cannot be managed so as to allow for more preferred designs.
- geomorphically-based roughened channel designs completed under this Programmatic Agreement shall not create barriers to aquatic organism movement.
- geomorphically-based roughened channel designs will be submitted to the Service for pre-approval prior to using the Programmatic Agreement.

Design Amendments

These design amendments supersede the incorporated references.

1. Streambed Material Depth: Standard MaineDOT design will be for two feet of culvert streambed material (CSM) in culverts. Based on stream geomorphic assessment, the MaineDOT may adjust CSM depth up or down in accordance with the references.
2. Streambed Material Gradation: Streambed material particle gradations will be based on stream geomorphic assessments and determined according to the references. When streambed depth is greater than or equal to two feet, the lower 50 percent may have a D_{84} as large as the stable size at Q_{50}, but no larger than 50 percent of the total streambed depth.

Literature Cited

Barnard, R.J., J. Johnson, P. Brooks, K.M. Bates, B. Heiner, J.P. Klavas, D.C. Ponder, P.D. Smith, and P.D. Powers. 2013. Water Crossings Design Guidelines. Washington Department of Fish and Wildlife. Washington State Aquatic Habitat Guidelines. Olympia, Washington. URL: *http://wdfw.wa.gov/publications/01501/*; accessed December 21, 2016.

Forest Service Stream-Simulation Working Group. 2008. Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings. US Forest Service Guide. U.S. Forest Service, National Technology and Development Program, San Dimas, California. URL: *http://www.fs.fed.us/eng/pubs/pdf/StreamSimulation/hi_res/%20FullDoc.pdf*; accessed December 27, 2016.

Love, M., and K. Bates. 2009. California Salmonid Stream Restoration Manual, Part XII, Fish Passage Design and Implementation. California Department of Fish and Wildlife, Sacramento, CA. URL: *https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=12512*; accessed December 12, 2016.

Bates, K., and R. Kirn. 2009. Guidelines for the Design of Stream/Road Crossings for Passage of Aquatic Organisms in Vermont. Vermont Fish and Wildlife Department. Montpelier, Vermont. URL: *http://www.vtfishandwildlife.com/common/pages/DisplayFile.aspx?itemId=111510*; accessed December 12, 2016.

Appendix C–Turbidity Monitoring Protocol

MaineDOT

In-Water Construction Turbidity Monitoring Protocol

MaineDOT Environmental Office
By Eric Ham & Bradford Folta Jr.

August 2016

Abstract

When conducting in-water constructions like a bridge, culvert, or other structure, there are a number of changes made to the surrounding and immediate ecosystems. This protocol seeks to establish a baseline data set for any and all future in-water construction events with regards to turbidity. Turbidity is the suspension of particles within a fluid. An increase in suspended particles in the water leads to the water being more opaque which leads to damage of existing aquatic creatures and fauna. Turbidity can be introduced into an aquatic system a number of ways; however, due to the alteration that occurs when building a structure in-water, we will focus on turbidity associated with said construction. Turbidity from this is typically caused by run-off, exposure of sediment/soil, or debris-flow. To limit the amount of damage done by turbidity, this protocol will assist in the formation of guidelines and rules that contractors and agencies must follow when conducting in-water construction on the Maine Department of Transportation's (MaineDOT) projects.

Background & Applicability

The MaineDOT and the U.S. Fish and Wildlife Service have identified a gap within data from the Gulf of Maine Distinct Population Segment of Atlantic salmon regarding turbidity releases during in-water construction activities.

During the construction of cofferdams, Best Management Practices themselves, there are releases of turbid water into the water-body where the project work is taking place. This protocol will be used to establish baseline data to determine future limits and potential effects from these turbidity events on Atlantic salmon and critical habitat.

A state standard for turbidity NTU[1] has not been set by any Maine state agencies regarding in-water construction. The limited monitoring that has been performed, in regards to turbidity, is not an appropriate standard that can be met by each project.

In the first two years (or longer if appropriate project don't occur) after issuance of the Programmatic Biological Opinion, the MaineDOT will monitor the following in water activities:

In water activity	# of monitoring events
Sandbag Cofferdam Installation	4
Sandbag Cofferdam Removal	4
Pile Driving (includes both impact, vibro)	4
Pile/Geotech Drilling	2
Bypass Channel Installation/Initiation of flow	2
Bypass Channel Removal	2
Work Area Dewatering	4
Riprap Installation Outside of a Cofferdam	4

[1] Nephelometric Turbidity Units (NTU)-Unit of measure for Turbidity.

Definitions

Background Monitoring Point. A point, in water, that is not affected by any gross disturbance caused by the project. Background monitoring points should be collected as far upstream as right-of-way allows.

Mixing Zone. The mixing zone begins at the point where the construction discharge enters the water column and ends where the discharge has completely mixed with the said water. A mixing zone cannot be defined until a gross disturbance is witnessed on-site. It is often that this zone is outside of the MaineDOT right of way.

Required equipment

- Safety equipment (PPE[2], PFD[3], Etc.)
- Turbidity meter
- GPS unit
- Tape measure with weighted end for water depth
- Time device (Cell phone, watch)
- Turbidity Monitoring Protocol Datasheet

Required Accuracy

- Turbidity meter resolution must be within ±0.1 NTU,
- have an accuracy of: ±2 NTU for readings below 100 NTU, and
- accuracy of ±3 NTU for readings over 100 NTU.

Meter Type

NTU can be recorded with two types of Turbidity meters. Some turbidity monitors require that water samples be collected in vials and placed in a machine, while others allow for the placement of a probe in the water column that can record instantaneous readings at a set interval.

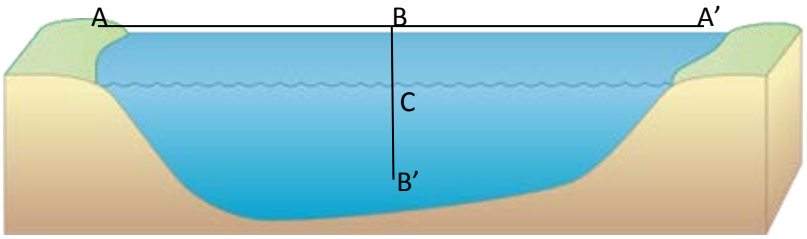
Procedure

Data will be collected before construction starts (pre-construction) to establish a baseline, and after construction has started or is in progress (syn-construction). These two collection periods work together to help better understand the stream system as a whole at the project site.

Pre-construction. Collection of a background monitoring point should be taken upstream of the proposed site as far as the right-of-way will allow. Using a tape measure, measure from one bank to the other (A→A') to determine stream width, divide the stream width by two to determine the stream center (B). Then, at stream center, take a stream depth (B→B') and divide

[2] PPE- Personal Protective Equipment, specifications listed in MaineDOT's PPE Protocol
[3] PFD- Personal floatation device, specifications listed in MaineDOT's PFD Protocol

that by two to determine center of water column (C). This may require a boat and other gear as needed.



$$Stream\ Center = \frac{Stream\ Width}{2} \qquad Center\ of\ water\ column = \frac{Water\ Depth}{2}$$

Figure 1. Stream Cross-section with Measurements

Depending on the device, make sure the probe or measurement device falls in the center of the water column. This can be done by measuring the device and determining where it will hang relative the water column.

Syn-construction. During construction, water monitoring should take place within the downstream right-of-way following any of these in-water activities:

In-water activity
Sandbag Cofferdam Installation
Sandbag Cofferdam Removal
Pile Driving (includes both impact, vibro)
Pile/Geotech Drilling
Bypass Channel Installation/Initiation of flow
Bypass Channel Removal
Work Area Dewatering
Riprap Installation Outside of a Cofferdam

To choose a proper monitoring site, make sure that you are positioned far enough downstream that you can capture any debris-flow or turbidity in the water. Distance from the in-water work is site specific. The point should be collected at the *mixing zone*. At the mixing zone the turbidity in question should be mixed within the water column. Measuring this point during construction should render a NTU higher than the baseline point. NTU readings should be taken in 1-minute intervals, best done with modern water-monitoring units. If different construction activities result in identical mixing zones, then the same site should be used for all monitoring activities while construction is in progress. In other instances, such as large rivers or waterways complicated by islands or shoals, different construction activities may have different mixing zones, e.g. cofferdams placed on one side of a wide river versus cofferdams placed on the

opposite side. Sampling site selection should be based on the mixing zone of the activity being monitored.

Please remember all attempts should be made to monitor at the downstream point of the mixing zone. If this is not possible, then the use of multiple monitoring sites is permitted. This/These point(s) should be recorded in the report, if unable to collect the sample within the right-of-way, please note/document that in the report and explain the alternate collection sampling location used. Monitoring must occur downstream of any discharge hoses of bypass pumps or outlets of temporary sedimentation basins.

Reporting Results

To report the results, please turn in tcollected information to the Maine Department of Transportation's Environmental Division by email (below) or paper copy by Mail.

For sending by Mail:

Maine Department of Transportation
Attn: Environmental
16 State House Station
Augusta, ME 04333-0016

For E-mail/Phone:

Eric.Ham@maine.gov
207-215-7356

Appendix D–Conversion Relationship between Nephelometric Turbidity Unitsnto Milligrams per Liter

Conversion of Nephelometric Turbidity Units (NTU) into milligrams per liter is required since NTU is used as a surrogate for Total Suspended Solids (TSS) and can be measured immediately in the field. NTU can then be converted into TSS once the relationship between the two measurements is formed. An NTU instrument measures the particles of matter that are naturally suspended in water and these particles can be clay, silt, finely divided organic and inorganic matter, plankton, and other microscopic organisms. Turbidity is a measurement of how light scatters when it is aimed at water and bounces off the suspended particles; it is not a measurement of the particles themselves.

The NTU/TSS relationship is interpreted by linear regression analysis. The relationship between TSS and turbidity is unique to each instrument and each construction site, so instruments must be calibrated prior to field deployment. The following procedure will be used:

Step 1: Calibrate the turbidity meter according to manufacturer's instructions. Preferably a 3-point calibration is conducted with fresh calibration standards of known value, typically 0, 40 and 400 NTU. Calibration standards are available from laboratory suppliers, or the calibration can be done by laboratories that typically conduct turbidity tests.

Step 2: Obtain two 20 liter pails of water from the waterbody being worked in. The samples should be allowed to settle for approximately 1 hour or until all suspended sediment is removed from the water column.

Step 3: Prepare one kilogram slurry of fine material that is expected to be introduced to the waterbody by construction activities. Depending upon the monitoring distance downstream of the activity this may vary from fine sand to just silt and clay sizes. The slurry can be an amalgam of fines from the bed, bank and borrow.

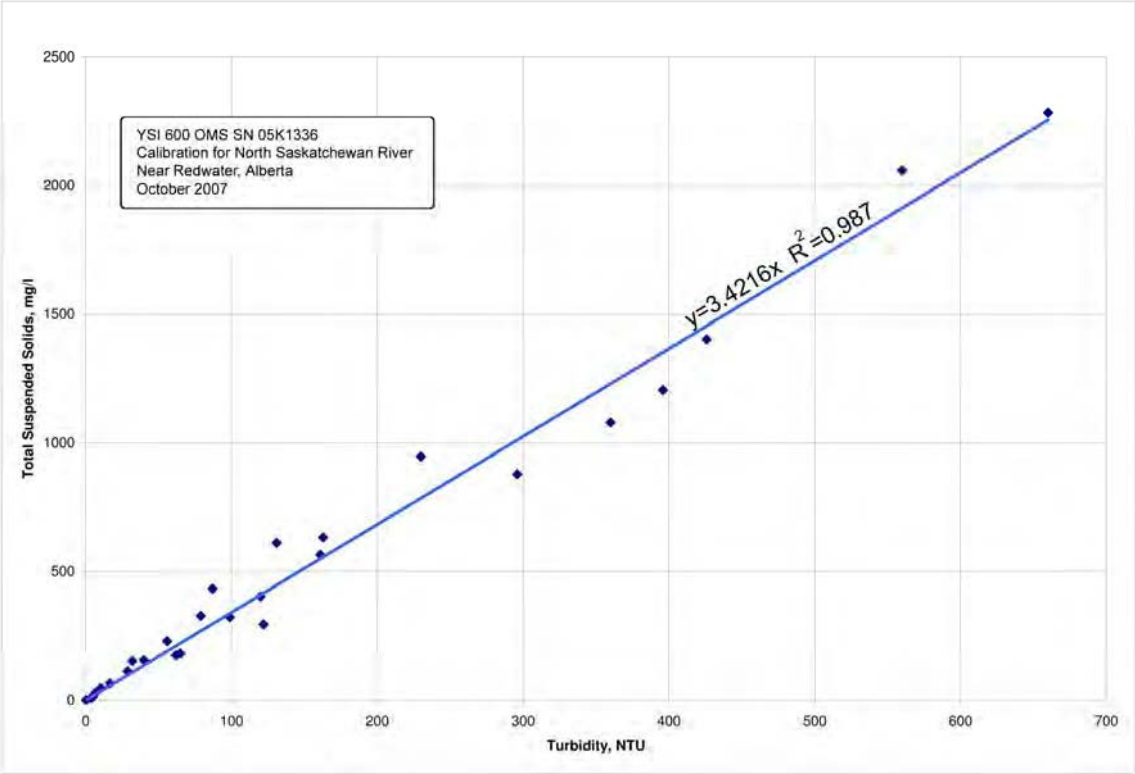
Step 4: In one of the 20 liter pails, measure and record the turbidity of the settled water. Extract a water sample for laboratory testing of TSS.

Step 5: Increase the level of suspended solids by introducing a small amount of the prepared slurry to the pail. Stir vigorously to ensure a homogeneous mixture. Measure and record the turbidity, then extract a water sample for laboratory testing. Continuous stirring may be necessary to keep sand size particles in suspension during this step.

Repeat Step 5 to obtain sufficient points to derive the NTU/TSS relationship similar to Figure 1. Ideally five points should be obtained with readings below 15 NTU and at least five additional points below 500 NTU. At least 20 samples (or more if needed) should be used in total to develop the linear relationship within an R-squared correlation coefficient of at least 0.85 (85 percent). The second pail of water can be used to temper the solution so a particular NTU reading can be obtained. Most instruments fail to respond, or 'blind', above a certain level, typically 1000 NTU for those intended for use in natural water bodies.

Turbid water samples should be sent to a qualified laboratory for TSS testing (American Society for Testing and Materials D3977 or similar). Once laboratory results have been obtained, the data can be plotted and an interpolated equation derived. This relationship is a simple straight line fit with a zero intercept unless the native waterbody has high background turbidity from chemical staining or dissolved solids, in which case the relationship will have a turbidity offset.

Figure 1. An Example TSS/NTU Relationship



Appendix E–Stream Crossing Replacement Monitoring Protocol

Longitudinal Profile

A longitudinal profile will be collected the first and third year after project construction. This profile will be collected following the protocols outlined in the design manuals. The only difference being that this profile may be short and targeted at parts of the profile that had changed after the project's completion.

Photos

- At a minimum, the following photos will be provided:
- Photo US of any areas that have experience down cutting or fine sediment loss.
- US from inlet of the crossing structure
- Photo looking through crossing structure
- Photos of substrate example inside of the structure at the inlet, middle, and outlet
- DS from the outlet of the crossing structure
- Photo of any DS areas that have experienced grade/substrate changes

Qualitative Measurements

Depth and velocity measures will be taken at the following locations:

- Inlet
- Middle
- Outlet
- At multiple locations on any grade control element

Low Flow Channel

- Document the presence and location of a low flow channel through the structure

The monitoring of the substrate above is qualitative. The Service may request a 'pebble count' following the U.S. Forest Service guide (Forest Service Stream-Simulation Working Group 2008) at any of the structures if the qualitative monitoring reveals any potential issues.

Literature Cited

Forest Service Stream-Simulation Working Group. 2008. Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings. U.S. Forest Service Guide. U.S. Forest Service, National Technology and Development Program, San Dimas, California. URL: *http://www.fs.fed.us/eng/pubs/pdf/StreamSimulation/hi_res/%20FullDoc.pdf*; accessed December 27, 2016.

Appendix F–Hydroacoustic Monitoring Protocol

Hydroacoustic Monitoring Template

Project Name

UNDERWATER NOISE MONITORING PLAN

*****TEMPLATE*****

Replace underlined blue italic text with project information.

Blue italic text is guidance.

Plain, black text ***is template language.***

All blue italic text should be replaced or omitted for final production.

Prepared by:

Name and full contact information

Signature Block

Date

INTRODUCTION (This section will be project specific)

The *full agency name* proposes to *detailed project description.* See vicinity map (Figure 1).

Figure 1. Vicinity map of *name project*.

PROJECT AREA ***(This section will be project specific)***

Describe the location of the project, including all water bodies that are affected. Identify the U.S. Geological Survey hydrologic unit, both the name and code, where the project is located. Include detailed maps and figures, when available, relative to environmental features that influence monitoring (e.g., geology, bathymetry, etc.).

PERMIT/ESA CONDITIONS ***(This section will be project specific and is applicable only when the ESA consultation is complete or Federal/State/local permits have been issued. Each agency should modify this section to reflect the various types of permit/Endangered Species Act (ESA) conditions that they see.)***

Summarize the Federal/State/local permit conditions and the ESA requirements that relate to the underwater noise. Permit conditions include monitoring requirements, timing restrictions, etc. The ESA requirements are found in the Incidental Take Statement and Terms and Conditions sections of the biological opinion. These requirements vary between biological opinions, but can include monitoring requirements, timing restrictions, limits on cumulative sound exposure level (cSEL) at a given distance, description of the area where the thresholds must not be exceeded, the allowable number of piles driven per day, the allowable number of pile strikes per day, or a limit on the single strike SEL.

PILE INSTALLATION LOCATION ***(This section will be project specific)***

Figure 2 indicates the location of the *provide location of the structure(s) in need of pile driving*. There will be a total of *XX* piles driven as part of the *name structure(s)*.

Figure 2. Location of *name structure(s)* where pile driving activity will take place. *This information must be in enough detail to allow the reader to assess the monitoring locations.*

PILE INSTALLATION

Impact Pile Driving for Fish Consultations

Provide pile installation information. For example:

Hydroacoustic monitoring will be conducted for *XX* piles struck with an impact hammer. Piles chosen to be monitored are driven in water depths that are representative of mid-channel or typical water depths at the project location where piles will be driven.

The number of piles to be monitored will depend on a variety of factors–some projects may require that all piles be monitored, while others may require a representative sample of piles be monitored. If a sample of piles is to be monitored, provide the considerations taken and the rationale used in choosing a representative number of piles, such as, bathymetry, total number of piles to be driven, substrate type, depth of water, distance from shore, river, or stream bank, and any other considerations, as appropriate. When monitoring a subset, a minimum of five piles should be monitored. Additional monitoring to produce a representative sample may be warranted when projects are driving a large number of piles, driving multiple piles of varying diameters in differing substrates, driving different types of piles, or driving piles in widely differing depths.

Hydroacoustic monitoring of *type of pile* with impact driving will include:

- Monitoring *X piles, out of a total of Y piles driven for the project*.
- Testing sound attenuation system effectiveness.

Figure 3 indicates the location of the piles to be monitored and the approximate hydrophone locations for each pile being monitored. All hydrophones will be placed at least 3.3 feet (1 meter) below the surface. *If only one hydrophone at one distance is to be used it is acceptable for the hydrophone to be placed 33 feet (10 meters) from the pile at midwater depth. If hydrophones will be placed at more than one distance from the pile and used to calculate transmission loss over distance, water depth should be at least 13 feet (4 meters) and it is suggested that the additional hydrophone nearest the pile be placed at least 3 H from the pile where H is the water depth at the pile and at 0.7 to 0.85 H depth from the surface. In waters less than 13 feet (4 meters) deep, a single hydrophone at midwater depth is sufficient*[1]. Hydrophones will be located *X* meters from each pile with a clear acoustic line-of-sight between the pile and the hydrophone. *Additional distances measured concurrently are desirable, if possible, to estimate the site specific range to the threshold boundary. Include any additional distances or depths where hydrophones will be located. If airborne noise monitoring is required, the primary measurement microphone shall be placed 50 feet (15 meters) from the pile at least 6 feet (2 meters) above the ground or water, and shall have an unobstructed view of the length of the pile.*

1 Some projects may need or require more than one hydrophone to collect real time measurements at multiple locations or multiple distances. In these situations multiple hydrophones can be placed at midwater depths.

Figure 3. Location of the piles that will be monitored on the *name structure(s)*.

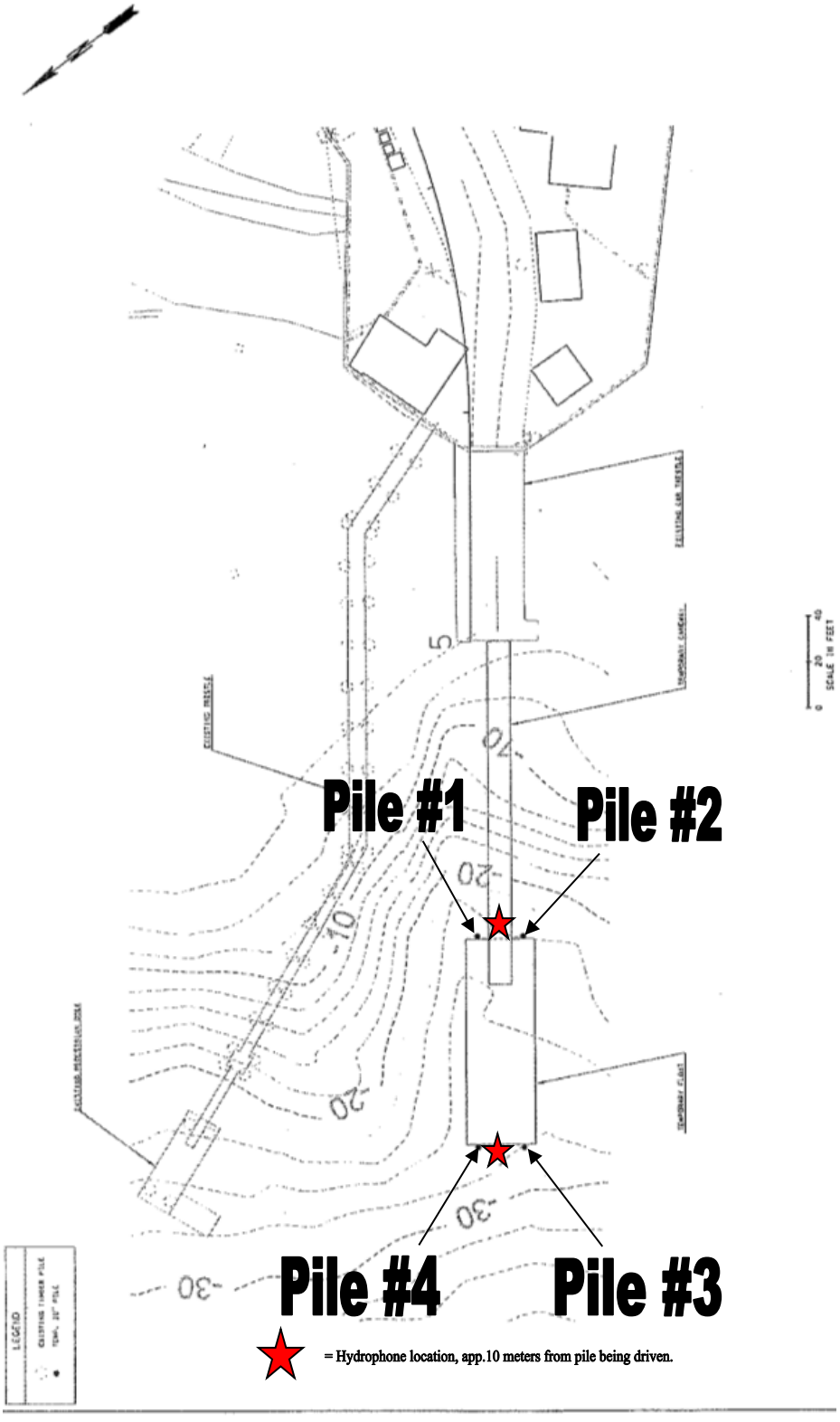


Table 1 lists the *name structure(s)* to be installed, the water depth, and the number and size of piles that will be installed.

Table 1. Depth, Number Piles to be Monitored

Structure	Water Depth	Structural Components Installed
Name structure	*X feet to X feet*	*X-XX-inch diameter type of pile*

CONTRACTOR REQUIREMENTS

The contractor will submit a detailed description of their qualifications, which must include a minimum of a bachelor's degree in a related field[2] and 3 years' experience in noise monitoring and analysis, and monitoring plan based on this template for approval by [INSERT AGENCY NAME]. A list of the contractors' proposed sound level monitoring equipment shall be included along with specifications and a description of the purpose. The measurement range in terms of amplitude (in decibels [dB] referenced to one micropascal [µPa]), sensitivity and frequency shall be stated. A minimum frequency range of 20 hertz (Hz) to 20 kilohertz (kHz) and a minimum sampling rate of 48,000 Hz will be used when monitoring. Sampling rates higher than 48 kHz are preferred. Table 2 describes the minimum requirements of the equipment to be used. In addition to the equipment selection, quality control/quality assurance procedures should be described (e.g., how will system responses be verified and how will data be managed).

Table 2. Equipment for underwater sound monitoring (hydrophone, signal amplifier, and calibrator). All have current National Institute of Standards and Technology (NIST) traceable calibration. ***This table is intended as a guideline and exact specifications can be adjusted to meet the needs of the individual project or contractors' equipment.***

Item	Specifications	Minimum Quantity	Usage
Hydrophone	*Receiving Sensitivity– -211 dB re 1 volt/µPa*	*1*	*Capture underwater sound pressures near the source and convert to voltages that can be recorded/analyzed by other equipment.*
Hydrophone	*Receiving Sensitivity– -200 dB re 1/µPa*	*1*	*Capture underwater sound pressures for background levels and convert to voltages that can be recorded/analyzed by other equipment.*

2 This can include Institute of Noise Control Engineering of the USA (INCE/USA) certification or related fields such as acoustics, physics, oceanography, geology or other physical sciences that have required coursework in physics.

Signal Conditioning Amplifier	*Amplifier Gain-* *0.1 mV/pC to 10 V/pC* *Transducer Sensitivity Range- 10-12 to 103 C/MU*	*1*	*Adjust signals from hydrophone to levels compatible with recording equipment.*
Calibrator (pistonphone-type)	*Accuracy-* *IEC 942 (1988) Class 1*	*1*	*Calibration check of hydrophone in the field.*
Digital Signal Analyzer	*Sampling Rate-* *48kHz or greater*	*1*	*Analyzes and transfers digital data to laptop hard drive.*
Microphone (free field type)	*Range- 30–120 dBA* *Sensitivity-* *-29 dB ±3 dB (0 dB=1 V/Pa)* *Wind Screen*	*1*	*Monitoring airborne sounds from pile driving activities (if not raining).*
If water velocity ~> 1m/s, Flow shield	*Open cell foam cover or functional equivalent*	*1/hydrophone*	*Eliminate flow noise contamination.*
Laptop computer *or* *Digital Audio Recorder*	*Compatible with digital signal analyzer*	*1*	*Record digital data on hard drive or digital tape.*
Real Time and Post-analysis software	*-*	*1*	*Monitor real-time signal and post-analysis of sound signals.*

To facilitate further analysis of data, full bandwidth, time-series underwater signals shall be recorded as a text file (.txt) or wave file (.wav) or similar format. Recorded data shall not use data compression algorithms or technologies (e.g. MP3, compressed wav, etc.).

METHODOLOGY

Impact Pile Driving for Fish Consultations (and ESA listed diving sea birds, if relevant)

Underwater background sound level measurements are optional, however, if desired then the National Marine Fisheries Service (NMFS) guidance should be followed (NMFS 2012a-c).

If one hydrophone at one distance is to be used it is acceptable for the hydrophone to be placed 33 feet (10 meters) from the pile and at midwater depth. If hydrophones will be placed at more than one distance from the pile it is suggested that the hydrophone nearest the pile be placed at

least 3 H from the pile where H is the water depth at the pile and 0.7 to 0.85 H depth from the surface. The hydrophone*(s)* will be placed at *X meters* depth at a distance of *X meters* from each pile being monitored, in waters of *X meters* depth. *If water velocity is 1 meter per second or greater, 3 to 10 feet (1 to3 meters) off the bottom may be recommended for near field hydrophones and greater than 16.4 feet (5 meters) from the surface may be recommended for any far field hydrophones.* A weighted tape measure will be used to determine the depth of the water. The hydrophone*(s)* will be attached to a nylon cord, a steel chain, or other proven anti-strum features if the current is swift enough to cause strumming of the line. The nylon cord or chain will be attached to an anchor that will keep the line the appropriate distance from each pile. The nylon cord or chain will be attached to a float or tied to a static line at the surface. The distances will be measured by a tape measure, where possible, or a range-finder. The acoustic path (line of sight) between the pile and the hydrophone*(s)* should be unobstructed in all cases.

When collecting sound measurements in an area with currents (i.e., in rivers or tidally influenced areas), appropriate measures will be taken, when necessary, to ensure that the flow-induced noise at the hydrophone will not interfere with the recording and analysis of the relevant sounds (NMFS 2012a-c). As a general rule, current speeds of five feet per second (1.5 meters per second) or greater are expected to generate significant flow-induced noise, which may interfere with the detection and analysis of low-level sounds such as the sounds from a distant pile driver or background sounds. If such measures are necessary, include a description of those measures. For example:

> *If it becomes necessary to reduce the flow-induced noise at the hydrophone, a flow shield will be described and installed around the hydrophone to provide a barrier between the irregular, turbulent flow and the hydrophone. If no flow shield is used in these situations, the current velocity will be measured and a correlation between the levels of the relevant sounds (background or pile driving) and current speed will be made to determine whether the data is valid and can be included in the analysis.*

The hydrophone calibration*(s)* will be checked at the beginning of each day of monitoring activity. *The method of calibration and calibration equipment used will be described.* NIST traceable calibration forms shall be provided for all relevant monitoring equipment. Prior to the initiation of pile driving, the hydrophone will be placed at the appropriate distance and depth as described above.

The onsite inspector/contractor will inform the acoustics specialist when pile driving is about to start to ensure that the monitoring equipment is operational. Underwater sound levels will be continuously monitored during the entire duration of each pile being driven with a minimum one-third octave band frequency resolution. The wideband instantaneous absolute peak pressure and Sound Exposure Level (SEL) values of each strike, and daily cumulative SEL should be monitored in real time during construction to ensure that the project does not exceed its authorized take level. Peak and RMS pressures will be reported in dB (re:1 µPa). SEL will be reported in dB (re: 1 $\mu Pa^2 \cdot sec$). Wideband time series recording is strongly recommended during all impact pile driving.

Prior to, and during, the pile driving activity, environmental data will be gathered, such as water depth and tidal level, wave height, and other factors that could contribute to influencing the underwater sound levels (e.g. aircraft, boats, etc.). Start and stop time of each pile driving event and the time at which the bubble curtain or functional equivalent[3] is turned on and off will be logged.

The contractor or agency will provide the following information, in writing, to the contractor conducting the hydroacoustic monitoring for inclusion in the final monitoring report: a description of the substrate composition, approximate depth of significant substrate layers, hammer model and size, pile cap or cushion type, hammer energy settings and any changes to those settings during the piles being monitored, depth pile driven, blows per foot for the piles monitored, and total number of strikes to drive each pile that is monitored.

Sound Attenuation Monitoring

All monitored piles may be tested with the sound attenuation system on and off (or presence and absence) to test its effectiveness[4]. To account for varying resistance as the pile is driven; the sound attenuation device will be turned off for *(describe schedule for turning on and off)* periods during the beginning, the middle third, and near the end of the drive. After turning off the attenuation system, pile driving should not resume for at least two minutes to allow time for air bubbles to completely disperse. *For piles that require less than 5 minutes to drive, pile driving should occur for only two periods with the bubbles off, one near the beginning and once near the end of the drive.*

SIGNAL PROCESSING

Impact Pile Driving for Fish Consultations (and any Service listed, diving sea bird)

Post-analysis of the underwater pile driving sounds will include:

- Number of pile strikes per pile and per day.
- For each recorded strike (or each strike from a subset), determine the following:
    - The peak pressure, defined as the maximum absolute value of the instantaneous pressure (overpressure or underpressure).
    - The root mean squared sound pressure across 90 percent of the strikes energy ($RMS_{90\%}$).
    - Sound exposure level, measured across 90 percent of the accumulated sound energy ($SEL_{90\%}$). Calculation methodology is provided in Appendix 1.

3 A functional equivalent must function as well as or better than the attenuation device that was proposed during consultation or required by the ESA consultation or applicable permits. It must achieve the same or better sound level reductions that were used in the calculations during ESA consultation or the permitting process.

4 Note: There may be circumstances where the U.S. Fish and Wildlife Service determines that unattenuated pile driving (striking the pile with the bubble curtain turned off) would pose a significant risk of injury to species. In those situations, the Service may request that unattenuated pile driving does not occur and that hydroacoustic monitoring be conducted to determine the extent at which certain thresholds are met instead. This will need to be determined on a case by case basis for projects that may affect listed species.

- Maximum, mean, and range of the peak pressure, with, and if applicable, without attenuation.
- Maximum, mean, range, and Cumulative Distribution Function (CDF) of the $RMS_{90\%}$, both with and if applicable, without attenuation where the CDF is used to report the percentage of $RMS_{90\%}$ values above the thresholds.
- Maximum, mean, and range of the $SEL_{90\%}$, both with and if applicable, without attenuation.
- Cumulative SEL (cSEL) across all of the pile strikes. If SEL was calculated for all strikes, cSEL is estimated as indicated in Appendix 1. If SEL was calculated for a subset of strikes, cSEL is estimated as follows: cSEL = SEL_{mean} + 10*log(total # strikes).
- Where surrogate piles are monitored to represent a larger project, an estimate of the cSEL during a typical day of construction driving must be reported by summing the SEL over the expected number of pile strikes in a typical day for the larger project: cSEL = SEL_{mean} + 10*log(#strikes). The SEL_{mean} used in this calculation must correspond with the actual sound attenuation measures that will be used during construction of the larger project.
- A frequency spectrum both with and, *if applicable*, without attenuation, between a minimum of 20 and 20 kHz for up to eight successive strikes with similar sound levels.

If airborne noise monitoring is required, both A-weighted and unweighted measurements will be acquired. Broadband back-to-back RMS L_{max} (peak) and L_{eq} (average) five-minute measurements will be made over the duration of pile driving,. L_{max} measurements should be taken with a portable analyzer set for "fast" response (125 meters per second). For at least one full pile sequence of each pile size and substrate type, frequency spectrum measurements (L_{max} and L_{eq}) using a minimum resolution of one-third octave bands shall be taken to show the spectral content of the impact pile. If measuring background sound levels in the absence of construction is not possible, then report the L_{95} statistic.

ANALYSIS

Impact Pile Driving for Fish Consultations

Analysis of the data from the San Francisco-Oakland Bay Bridge Pile Installation Demonstration project (PIDP) indicated that 90 percent of the acoustic energy for most pile driving impulses occurred over a 50 to 100 millisecond period with most of the energy concentrated in the first 30 to 50 milliseconds (Caltrans et al. 2001). The RMS values computed for this project will be computed over the duration between where 5 percent and 95 percent of the energy of the pulse occurs. The SEL energy plot will assist in interpretation of the single strike waveform. The single strike SEL associated with the highest absolute peak strike along with the total number of strikes per pile and per day will be used to calculate the cumulative SEL for each pile and each 24-hour period.

In addition a waveform analysis of the individual absolute peak pile strikes will be performed to determine any changes to the waveform with the *name type of noise attenuation device*. A comparison of the frequency content with and without noise attenuation will be conducted.

Units of underwater sound pressure levels will be dB (re:1 µPa)and units of SEL will be re:1 μPa^2sec.

REPORTING

If sound attenuation devices are used during the monitoring, include the following text and analysis:

An analysis of the change in the waveform and sound levels with and without the *name type of noise attenuation device for impact driving* operating will be conducted.

Preliminary results for the daily monitoring activities, if required, will be submitted/reported to the primary point of contact[5] at each of the applicable agency (the NMFS or the Service [Services]) within *XX hours* after monitoring concludes for the day. In addition a final draft report including data collected and summarized from all monitoring locations will be submitted to the Services within 90 days of the completion of hydroacoustic monitoring. The results will be summarized in graphical form and include summary statistics and time histories of impact sound values for each pile. A final report will be prepared and submitted to the Services within 30 days following receipt of comments on the draft report from the Services. The report shall include:

1. Size and type of piles.
2. A detailed description of the *name type of noise attenuation device*, including design specifications *(if applicable)*.
3. The impact hammer energy rating used to drive the piles, make and model of the hammer.
4. A description of the sound monitoring equipment.
5. The distance between hydrophone*(s) or microphone(s)* and pile.
6. The depth of the hydrophone*(s)* and depth of water at hydrophone locations.
7. The distance from the pile to the water's edge.
8. The depth of water in which the pile was driven.
9. The depth into the substrate that the pile was driven.
10. The physical characteristics of the bottom substrate into which the piles were driven.
11. The total number of strikes to drive each pile and for all piles driven during a 24-hour period.
12. The underwater wideband background sound pressure level reported as the 50 percent CDF *(if applicable)*.
13. The results of the hydroacoustic monitoring, as described under Signal Processing. An example table is provided in Appendix 3 for reporting the results of the monitoring.

[5] The primary point of contact is the biologist that conducted the section 7 consultation for the Service(s). In the event that the consulting biologist is not available, communication regarding monitoring results and reports should be addressed to the manager of the consultation branch or division with a reference to the consultation title.

14. The distance at which peak, cSEL, and RMS values exceed the respective threshold values.
15. A description of any observable fish, marine mammal, or bird behavior in the immediate area will and, if possible, correlation to underwater sound levels occurring at that time.
16. *If airborne noise monitoring is required, broadband A-weighted and unweighted maximum, minimum, and average L_{max} and L_{eq} levels shall be tabulated for every pile. For each pile size and substrate type frequency spectra (one-third octave minimum frequency resolution) charts will be included to show the frequency content of L_{max} and L_{eq} signatures. The frequency content of airborne noise background levels shall also be shown. Background sound levels or L_{95} surrogate for background sound shall be reported.*

REFERENCES

Caltrans, Illingworth & Rodkin, Inc., and Denise Duffy and Associates. 2001. Noise and Vibration Measurements Associated with the Pile Installation Demonstration Project for the San Francisco-Oakland Bay Bridge East Span, Final Data Report. California. Department of Transportation Environmental Program Task Order 2, Contract No. 43A0063. June 30, 2001. Petaluma, California.

NMFS. 2012a. Guidance Document: Data Collection Methods to Characterize Underwater Background Sound Relevant to Marine Mammals in Coastal Nearshore Waters and Rivers of Washington and Oregon. Memorandum: NMFS Northwest Fisheries Science Center–Conservation Biology Division and Northwest Regional Office–Protected Resources Division, January 31, 2012.

NMFS. 2012b. Guidance Document: Data Collection Methods to Characterize Impact and Vibratory Pile Driving Source Levels Relevant to Marine Mammals. Memorandum: NMFS Northwest Fisheries Science Center–Conservation Biology Division and Northwest Regional Office–Protected Resources Division, January 31, 2012.

NMFS. 2012c. Guidance Document: Sound Propagation Modeling to Characterize Pile Driving Sounds Relevant to Marine Mammals. Memorandum: NMFS Northwest Fisheries Science Center–Conservation Biology Division and Northwest Regional Office–Protected Resources Division, January 31, 2012.

Calculation of Cumulative SEL

An estimation of individual SEL values can be calculated for each pile strike by calculating the following integral, where T is T_{90}, the period containing 90 percent of the cumulative energy of the pulse (Equation 1).

Equation 1

$$SEL = 10\log\left(\int_0^T \frac{p^2(t)}{{p_0}^2} dt \right) \quad dB$$

Calculating a cumulative SEL from individual SEL values cannot be accomplished simply by adding each SEL decibel level arithmetically. Because these values are logarithms they must first be converted to antilogs and then accumulated. Note, first, that if the single strike SEL is very close to a constant value (within 1 dB), then cumulative SEL=single strike SEL + 10 times log base 10 of the number of strikes (N), i.e., $10\text{Log}_{10}(N)$. However if the single strike SEL varies over the sequence of strikes, then a linear sum of the energies for all the different strikes needs to be computed. This is done as follows: divide each SEL decibel level by 10 and then take the antilog. This will convert the decibels to linear units (or $uPa^2 \bullet s$). Next compute the sum of the linear units and convert this sum back into dB by taking 10Log_{10} of the value. This will be the cumulative SEL for all of the pile strikes.

Calculation of a Cumulative Distribution Function and Plot for Background Sound Level Analysis

Data from three full 24-hour underwater measurement cycles (minimum) are used to calculate a 30-second Root Mean Square (RMS) value for each 30-second period for the entire dataset. The RMS should be calculated for both the full frequency range recorded as well as a separate dataset which has been passed through a high pass filter thus eliminating those frequencies below 1000 Hz. These datasets are then grouped into 24-hour periods. To determine if the data is approximately log-normal in distribution, each 24-hour period is plotted as a Probability Density Function (PDF). Each 24-hour period can be plotted on the same PDF plot. The plots should be approximately log normal in distribution and thus can be used in the further analysis. Each day of data should have an approximately Gaussian sigmoid shape, the differences between them and the ideal might be hard to spot, but the sigmoid from day to day will show noticeable variation. Data which does not approximate a log normal distribution should be excluded from further analysis.

The Cumulative Distribution Function (CDF) plot is obtained by plotting the normalized cumulative sum versus the bin location. You can also get the PDF from plotting the normalized bin count versus the bin location. The normalized bin count is obtained by dividing the count column by (number of data points multiplied by the space between 2 consecutive bins). This provides the integral of the PDF equal to 1. For instructions on creating a histogram in Microsoft Excel, see URL: *http://www.vertex42.com/ExcelArticles/mc/Histogram.html*; accessed January 23, 2017.

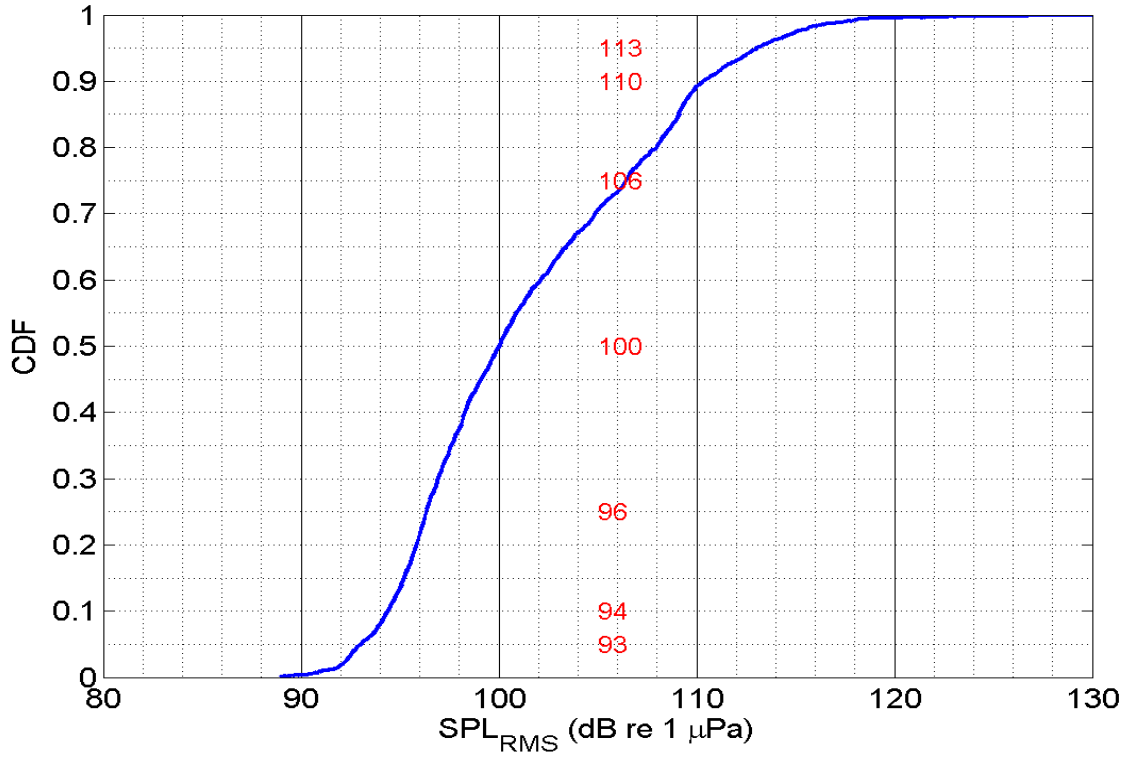

CDF
SPL$_{RMS}$ (dB re 1 μPa)
113
110
106
100
96
94
93
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
80
90
100
110
120
130

Table 1. Example table for required information for reporting the results of hydroacoustic monitoring of pile driving.

Date and Time	Pile ID	Hammer Impact or Vibratory	# Strikes or Vibratory Seconds	Distance to Pile from Hydrophone (meters)	Water Depth (meters)		Peak (dB)			$SEL_{90\%}$ (dB)				$RMS_{90\%}$ (dB)			Notes
					At Pile	At H-phone	Max	Min	Mean	Max	Min	Mean	$cSEL_{90\%}$	Max	Min	Mean	

Appendix G–Fish Evacuation Procedures

(updated 1/2013)

Qualified MaineDOT biologists will be capturing, handling, and removing fish from within cofferdams and water diversions prior to dewatering for projects where there is a concern that juvenile Atlantic salmon might be trapped within the project area. Capturing and handling juvenile Atlantic salmon causes physiological stress and can cause physical injury or mortality; to minimize these effects the following procedures will be followed by the MaineDOT during activities associated with projects in the batch consultation should Atlantic salmon be trapped during project activities:

1. An adequate number of MaineDOT Environmental Office staff will be onsite during construction and dewatering of all cofferdams and for fish salvage activities.

2. If it is possible that an adult Atlantic salmon could be present in the construction area, a visual survey of the construction area to inspect for the presence of an adult Atlantic salmon will be completed. Further precautions for adult Atlantic salmon will be followed after the visual inspection to ensure that adult Atlantic salmon are removed from the construction area prior to electrofishing.

3. The MaineDOT Environmental Office staff will follow the Maine Atlantic salmon Commission Disinfection Procedures (below).

4. Following installation of the upstream block net, fish may be hazed out (if site conditions warrant) of the proposed dewatered sections by walking seines downstream from the upstream block net location to the end of the construction site in an attempt to 'herd' fish out of the worksite. A downstream block net would then be installed and efforts to capture remaining fish with dip-nets would follow. The MaineDOT fisheries biologists experienced with construction area isolation, and competent to ensure the safe handling of all Endangered Species Act (ESA)-listed fish, will conduct or supervise the operation.

5. Install a block net or cofferdam downstream of the project site immediately after the sweep to ensure fish will not move back into the project area. The block net will be secured to the stream channel, bed, and banks until fish capture and transport activities are complete. Size and place the block net in the stream in such a way as to exclude ESA-listed juvenile salmonids expected to occur within the project vicinity at the time of construction without otherwise impinging these fish on the net. Monitor the block net once a day to ensure that it is properly functioning and free of organic accumulate.

6. Use one or a combination of the following methods to most effectively capture ESA-listed fish and minimize harm (Figure 1). Fish salvage shall proceed from the least invasive method to most invasive. Note that site conditions and other logistics may dictate the practicality of methodology used.

a) Hand Netting. Collect fish by hand or dip-nets, as the area is slowly dewatered.

b) Seining. Seine using a net with mesh of such a size as to ensure entrapment of the residing ESA-listed fish. The bottom or lead line has lead weights strung or crimped onto

it to weight the net. The top or float line includes cork, polystyrene foam, or plastic floats to keep the top of the seine near the water surface. The net is attached to wood or metal poles to handle the seine. Two persons hold the seine in a vertical position above the water and perpendicular to the flow at the downstream edge of a riffle. They then thrust the poles and lead line of the seine to the stream bottom. The poles are allowed to slant downstream so that the flow forms a slight pocket in the seine. This procedure is continued from one shoreline across the width of the channel to the other shoreline so that the entire riffle is sampled. The seine is then lifted out of the water and the fish removed (Bramblett and Fausch 1991).

c) Trapping. Minnow traps (or gee-minnow traps) are net or wire enclosures that trap live fish. Fish swim through the funnel shaped openings and are guided to a narrow opening at the center of the trap. These traps are best suited for collecting juvenile fish or small adult fish in pool habitat. Traps should be baited and fished overnight. In areas of moderate to high fish densities, maximum catches in minnow traps are approached within one to two hours, with catches dropping sharply when traps are fished longer than 24 hours between checks. For bait, salmon eggs are most widely used, but hamburger, canned cat food, salmon flesh, canned corn, shrimp, and sardines have been used successfully (Magnus et al. 2006).

d) Electrofishing. Before dewatering, electrofishing will be used as the last evacuation measure following the above other means of fish capture, or if they are not practical or effective following National Marine Fisheries Service (NMFS) guidelines (NMFS 2000).

a. Prior to the start of sampling at a new location, water temperature and conductivity measurements must be taken to evaluate electroshocker settings and adjustments.

b. Each electrofishing session must start with all settings (voltage, pulse width, and pulse rate) set to the minimums needed to capture fish. These settings should be gradually increased only to the point where fish are immobilized and captured, and generally not allowed to exceed conductivity-based maxima indicated in the NMFS (2000) guidelines. Only direct current or pulsed direct current should be used.

c. Electrofishing will not commence if the presence of an adult Atlantic salmon is suspected.

Figure 1. Examples of fish salvaging methods.



7. Handling of fish:

a) Juvenile Atlantic salmon will be netted (¼ inch knotless nylon) and immediately placed in a disinfected five gallon bucket filled with aerated stream water of ambient temperature.

b) Adult Atlantic salmon will be crowded into a handling device utilized by the Maine Department of Marine Resources (MDMR). The device consists of a rubber tube that is

closed on one end and open on the other (Figure 2). Small holes are placed in the closed end to allow some water out but allow all of the water to drain. Any adult Atlantic salmon captured this way will be moved immediately outside of the exclusion with the handling device and will not be held.

c) All other fish species will be placed in a disinfected five gallon bucket with aerated stream water of ambient temperature and released upstream, if possible, or downstream of the project if the upstream does not contain suitable habitat, or if construction operations dictate, under the assessment by the on-site biologist.

d) Minimize the number of fish stored in each five gallon buckets used for handling bucket to prevent overcrowding.

e) Handling time will be minimized. Monitor water temperature in buckets and well-being of captured fish.

f) Release fish from the isolated reach into a pool or area that provides cover and flow refuge after fish have recovered from stress of capture. Fish release upstream of the project site is preferred as sediment impacts would not likely affect individuals upstream of the crossing, but downstream release may be necessary is upstream reach is not suitable habitat for release or if construction operations dictate.

Figure 2-'Rubber sock' for adult Atlantic salmon handling.
Photo courtesy of the MDMR.

8. If need be, all salmonids will be clearly photo-documented for identification purposes. Photos will likely not be taken of adult Atlantic salmon to ensure minimal handling time.

9. A report and any photographs of transferred Atlantic salmon will be submitted to the U.S. Fish and Wildlife Service (Service), the NMFS, the MDMR, the Maine Department of Inland Fisheries & Wildlife (MDIFW), and the appropriate action agencies (the Federal highway Administration or the Army Corps of Engineers).

Due to variability in construction timing, potential scheduling conflicts, and other potential unforeseen issues, to ensure coverage and eliminate project delays several MaineDOT employees or their designees will be available during construction and dewatering of cofferdams. The list of qualified MaineDOT Environmental staff includes:

1. Eric Ham
2. Richard Bostwick
3. Jared Stanley
4. Ryan Annis
5. Mike Clark
6. Val Derosier

In addition to the staff listed above, other Environmental staff members, including qualified fisheries consultants, may be added pending Service approval. Anyone electrofishing will be required to have experience electrofishing salmonids in Maine. The MaineDOT may solicit the aid of fisheries biologists from the Service, the NMFS or the MDMR if agency staff is available to assist at the necessary time.

Biosecurity guidelines are practical steps that can be taken to minimize the spread of unwanted organisms. The guidelines below are designed to provide direction to the MaineDOT biologists working in Maine's lakes, rivers, and streams in order to minimize the potential for spread of aquatic species, particularly invasive species. These guidelines, which were adapted from the MDIFW guidelines, have been written to separate aquatic plants, aquatic animals, and aquatic pathogens. Questions regarding proper cleaning and/or disinfection of field equipment should be addressed with the equipment's manufacturer.

I. Equipment:

Large (40 plus gallon) trashcan
Portable hand-pump sprayer for field disinfection
Large stiff bristle brush
Spray bottle
Rubbing alcohol
Nolvasan disinfectant

II. Procedures to minimize the spread of aquatic plants

1. Equipment–Visual inspection of personal and other equipment (i.e. boots/waders/gloves) with hand removal of plants before leaving area.
2. Dip nets, trapnets and leads–Aquatic plants must be removed from nets before they are moved between waters. Nets should be visually inspected on land with hand removal of plants before leaving the sampling area. After seasonal use, nets will be cleaned, thoroughly dried in direct sun or indoor storage area, and re-inspected to remove any remaining plant material. Ensure all net sections and components are thoroughly dry for a minimum of three days. When possible, clean/dry nets and leads should be used between waters.
3. Reporting Requirements–Aquatic plants of unknown species or plants known to be aquatic nuisance species should not be transported unless placed in a sealed container. Small

specimens may be transported to the Maine Department of Environmental Protection (DEP) for species identification (DEP contact: John McPhedran 207/287-2813).

4. Waters with Documented Infestations–Biological staff should be extra diligent when working on waters with known infestations to prevent the further spread of invasives. When possible, staff should minimize contact and disturbance of aquatic invasive plant beds to reduce the risks of spreading the plant within the water being sampled and elsewhere. A current list of known plant infestations is available at DEP's website: *http://www.maine.gov/dep/water/invasives/*; accessed January 23, 2017.

III. Procedures to minimize the spread of aquatic animals

1. Equipment–Personal equipment (e.g. boots, waders, or gloves) should be rinsed clean of all visible mud and aquatic debris. Any other equipment should be rinsed clean of mud and aquatic debris.
2. Dip nets, trapnets and leads–Remove as much mud and aquatic debris as possible on site. After seasonal use, trapnets should be transported to maintenance camp or other suitable location and cleaned, thoroughly dried in direct sun or indoor storage area, and re-inspected to remove any remaining material. Ensure all net sections and components are thoroughly dry for a minimum of three days. When possible, clean/dry nets and leads should be used between waters.
3. Reporting Requirements–Unknown specimens and known aquatic invasive species should be transported in sealed containers for identification. Identification of invasive aquatic species should be reported to MDIFW (contact: John Boland 207/287-5261).
4. Waters with Documented Infestations–Biological staff should be extra diligent when working on waters with known infestations to prevent the further spread of invasives. In this case, nets should be cleaned, soaked in a three percent salt brine overnight to destroy freshwater aquatic organisms, rinsed, and dried in sunlight between uses.

IV. Procedures to minimize the spread of aquatic pathogens

1. Equipment–Field equipment that comes in constant contact with stream or lake water (i.e. waders, nets, seines, gloves, shocker wand and tail, buckets, measuring boards, etc.) should be cleaned & disinfected before use between waters. Disinfection for most equipment is accomplished with a two ounce Nolvasan/gallon water solution in the large trashcan. Equipment should be allowed to set in solution for 10 minutes then rinsed thoroughly. Equipment should be sprayed with a hand-pump style sprayer and allowed to set during transit to the new water. Delicate equipment such as electronic scales, conductivity meters, thermometers, etc., should be sprayed with alcohol and allowed to air dry.
2. Dip nets, trapnets and leads–are too large to be soaked and unlikely to get reasonable disinfection with a spray system. After seasonal use, trapnets should be transported to the regional headquarters, cleaned, thoroughly dried in direct sun or indoor area, and re-inspected to remove any remaining material. Ensure all net sections and components are thoroughly dry for a minimum of three days. When possible, clean/dry nets and leads should be used between waters.
3. Reporting Requirements–Fish encountered with lesions of reportable pathogens, or unknown pathogens should be preserved in 10 percent buffered formalin for storage or sent for

immediate necropsy to the MDIFW Fish Health Laboratory. Fish with obvious signs of clinical disease should be disposed of on land, rather than returned to the water to spread the pathogen.

4. Waters with Documented Pathogens–Biological staff should be extra diligent with disinfection procedures when working on waters with known pathogen issues to prevent the further spread of the organisms.

Literature Cited

Bramblett, R.G., and K.D. Fausch. 1991. Variable fish communities and the Index of Biotic Integrity in a Western Great Plains river. Transactions of the American Fisheries Society 120:752–769.

Magnus, D.L., A.D. Brandenberger, K.F. Crabtree, K.A. Pahlke, and S.A. McPherson. 2006. Juvenile salmon capture and coded wire tagging manual. Special publication No. 06-31. Alaska Department of Fish and Game, Anchorage, Alaska. December. URL: *http://www.sf.adfg.state.ak.us/FedAidPDFs/sp06-31.pdf*; accessed March 16, 2015.

NMFS. 2000. Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act. URL: *http://www.westcoast.fisheries.noaa.gov/publications/reference_documents/esa_refs/section4d/electro2000.pdf*; accessed December 9, 2016.

Appendix H–Activity and AMM Table

Activity	AMM(s)
ALL	3-5, 7-18, 25-27, 33, 34, and 45
Bridge replacement w/temp. trestle	2 and 46
Bridge replacement w/no temp. trestle	2 and 46
Culvert replacement	1
Geotech w/temp. trestle	1
Geotech w/no temp. trestle	None
Temp causeway	6 and 31
Spawning areas	12, 13, and 46
Bypass pumping	19, 20, 24, and 30
Sheet pile driving	21
Cofferdams	22, 23, 29, 30, and 55
Demolition and pile removal	28, 35, and 49-51
Grout bag repairs	32
Pile and H-pile driving	36-40
Blasting	41
Riprap	42, 43
Cable mats	44
Adults in holding pools	45
Rearing habitat	46
Invert and slipline	47, 48, and 60
Culvert extension	52, 56, and 57
Stream realignment	52
Bridge scour counter-measures	58 and 61
Tier 2 replacements >1.0 & <1.2 BFW	59

Activity → AMM# ↓	ALL	Bridge replacement w/temp. trestle	Bridge replacement w/no temp. trestle	Culvert replacement	Geotech w/temp. trestle	Geotech w/no temp. trestle	Temp causeway	Spawning areas	Bypass pumping	Sheet pile driving	Cofferdams	Demolition and pile removal	Grout bag repairs	Pile and H-pile driving	Blasting	Riprap	Cable mats	Adults in holding pools	Rearing habitat	Invert and sliplines	Culvert extension	Stream realignment	Bridge scour counter-measures	Tier 2 replacements >1.0 & <1.2 BFW
1				X	X																			
2		X	X																					
3	X																							
4	X																							
5	X																							
6							X																	
7	X																							
8	X																							
9	X																							
10	X																							
11	X																							
12	X							X																
13	X							X																
14	X																							
15	X																							
16	X																							
17	X																							
18	X																							
19									X															
20									X															
21										X														
22											X													
23											X													
24									X															
25	X																							
26	X																							
27	X																							
28												X												
29											X													
30									X		X													
31							X																	
32													X											
33	X																							
34	X																							
35												X												
36														X										
37														X										
38														X										

Activity → AMM# ↓	ALL	Bridge replacement w/temp. trestle	Bridge replacement w/no temp. trestle	Culvert replacement	Geotech w/temp. trestle	Geotech w/no temp. trestle	Temp causeway	Spawning areas	Bypass pumping	Sheet pile driving	Cofferdams	Demolition and pile removal	Grout bag repairs	Pile and H-pile driving	Blasting	Riprap	Cable mats	Adults in holding pools	Rearing habitat	Invert and sliplines	Culvert extension	Stream realignment	Bridge scour counter-measures	Tier 2 replacements >1.0 & <1.2 BFW
39														**X**										
40														**X**										
41															**X**									
42																**X**								
43																**X**								
44																	**X**							
45	**X**																	**X**						
46		**X**	**X**					**X**											**X**					
47																				**X**				
48																				**X**				
49												**X**												
50												**X**												
51												**X**												
52																					**X**	**X**		
53	**DO NOT EXIST**																							
54																								
55											**X**													
56																					**X**			
57																					**X**			
58																							**X**	
59																								**X**
60																				**X**				
61																							**X**	

Appendix I–Bubble Curtain Specification

These specifications are verbatim from National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS), Western Washington Fish and Wildlife Office Impact Pile Driving Sound Attenuation Specification

Unconfined Bubble Curtain Specifications:

1. General - An unconfined bubble curtain is composed of an air compressor(s), supply lines to deliver the air, distribution manifolds or headers, perforated aeration pipe, and a frame. The frame facilitates transport and placement of the system, keeps the aeration pipes stable, and provides ballast to counteract the buoyancy of the aeration pipes in operation.

2. The aeration pipe system shall consist of multiple layers of perforated pipe rings, stacked vertically in accordance with the following:

Water Depth (m)	No. of Layers
0 to less than 5	2
5 to less than 10	4
10 to less than 15	7
15 to less than 20	10
20 to less than 25	13

3. The pipes in all layers shall be arranged in a geometric pattern which shall allow for the pile being driven to be completely enclosed by bubbles for the full depth of the water column and with a radial dimension such that the rings are no more than 0.5 meters from the outside surface of the pile.

4. The lowest layer of perforated aeration pipe shall be designed to ensure contact with the substrate without burial and shall accommodate sloped conditions.

5. Air holes shall be 1.6 mm (1/16-inch) in diameter and shall be spaced approximately 20 mm (3/4 inch) apart. Air holes with this size and spacing shall be placed in four adjacent rows along the pipe to provide uniform bubble flux.
6. The system shall provide a bubble flux of 3.0 cubic meters per minute per linear meter of pipe in each layer (32.91 cubic feet per minute per linear foot of pipe in each layer). The total volume of air per layer is the product of the bubble flux and the circumference of the ring:

   $V_t = 3.0\ m^3/min/m$ * Circum of the aeration ring in m

   or

   $V_t = 32.91\ ft^3/min/ft$ * Circum of the aeration ring in ft

7. Meters shall be provided as follows:

a. Pressure meters shall be installed at all inlets to aeration pipelines and at points of lowest pressure in each branch of the aeration pipeline.

b. Flow meters shall be installed in the main line at each compressor and at each branch of the aeration pipelines at each inlet. In applications where the feed line from the compressor is continuous from the compressor to the aeration pipe inlet the flow meter at the compressor can be eliminated.

c. Flow meters shall be installed according to the manufactures recommendation based on either laminar flow or non-laminar flow.

Confined Bubble Curtain Specifications:

1. General - A confined bubble curtain is composed of an air compressor(s), supply lines to deliver the air, distribution manifolds or headers, perforated aeration pipe(s), and a means of confining the bubbles.

   a. The confinement (e.g. fabric, plastic or metal sleeve, or equivalent) shall extend from the substrate to a sufficient elevation above the maximum water level expected during pile installation such that when the air delivery system is adjusted properly, the bubble curtain does not act as a water pump (i.e., little or no water should be pumped out of the top of the confinement system).

   b. The confinement shall contain resilient pile guides that prevent the pile and the confinement from coming into contact with each other and do not transmit vibrations to the confinement sleeve and into the water column (e.g. rubber spacers, air filled cushions).

2. In water less than 15 meters deep, the system shall have a single aeration ring at the substrate level. In waters greater than 15 meters deep, the system shall have at least two rings, one at the substrate level and the other at mid-depth.

3. The lowest layer of perforated aeration pipe shall be designed to ensure contact with the substrate without sinking into the substrate and shall accommodate for sloped conditions.

4. Air holes shall be 1.6 mm (1/16-inch) in diameter and shall be spaced approximately 20 mm (3/4 inch) apart. Air holes with this size and spacing shall be placed in four adjacent rows along the pipe to provide uniform bubble flux.

8. The system shall provide a bubble flux of 3.0 cubic meters per minute per linear meter of pipe in each layer (32.91 cubic feet per minute per linear foot of pipe in each layer). The total volume of air per layer is the product of the bubble flux and the circumference of the ring:

   $V_t = 3.0\ m^3/min/m$ * Circ of the aeration ring in m

or

$V_t = 32.91\ ft^3/min/ft$ * Circ of the aeration ring in ft

5. Meters shall be provided as follows:

   a. Pressure meters shall be installed at all inlets to aeration pipelines and at points of lowest pressure in each branch of the aeration pipeline.

   b. Flow meters shall be installed in the main line at each compressor and at each branch of the aeration pipelines at each inlet. In applications where the feed line from the compressor is continuous from the compressor to the aeration pipe inlet the flow meter at the compressor can be eliminated.

   c. Flow meters shall be installed according to the manufactures recommendation based on either laminar flow or non-laminar flow.

not available at this time