NRR-PMDAPEm Resource

From: Mark Mattson [mmattson@normandeau.com]
Sent: Wednesday, January 08, 2014 12:22 PM
To: Logan, Dennis
Cc: Gray, Dara F (DGray@entergy.com)
Subject: Revised IPEC Sturgeon Impingement Monitoring Plan 3Dec13
Attachments: IPEC_sturgeon_monitoring_plan_revision_1a.pdf; IPEC_Sturgeon_BIOP_Monitoring_Plan_Cover_Letter_3Dec2013a.pdf

Hi Dennis – Dara called this morning to say you were having difficulty with the password protection of the revised IPEC Sturgeon Impingement Study Plan that I completed and distributed to NMFS and others (including you) on 3 December 2013 because the password would not let the document be uploaded to your ADAMS system. Try uploading the attached PDF versions of the cover letter and Study Plan, neither are password protected. If they don't work, the MS Word document is 15.8 mb (due to photos), but I am not sure if you can receive email attachments that large, and I know Dara cannot. So let me know if you were successful with these attachments, or if we need to try "Plan B".

Happy New Year. Mark

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Proposed Monitoring Plan for Indian Point Energy Center Take of Atlantic and Shortnose Sturgeons by Impingement at Cooling Water Intakes
Revision 1

Presented to:
Indian Point Energy Center
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Submitted:
3 December 2013

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Table of Contents

Page

List of Figures

1.0 Introduction

1.1 Regulatory Context

On 30 January, 2013, the National Marine Fisheries Service (NMFS) issued a final Biological Opinion (Opinion) and Incidental Take Statement (ITS) authorizing takes of Atlantic and Shortnose Sturgeon during the continued operation of the Indian Point Energy Center (IPEC) pursuant to existing operating licenses and proposed renewed operating licenses to be issued by the U.S. Nuclear Regulatory Commission (NRC). In the Opinion, NMFS addressed Shortnose Sturgeon and the Gulf of Maine Distinct Population Segment (DPS), the New York Bight DPS, and the Chesapeake Bay DPS of Atlantic Sturgeon.

Among other things, the Opinion requires that "Entergy must develop a proposed, draft monitoring plan designed to document all Atlantic and Shortnose Sturgeon impinged at IP1, IP2 and IP3 (trash racks and intake screens) while these facilities are operating under their existing operating licenses and the proposed renewed operating licenses. The draft monitoring plan must be provided to NMFS and NRC within 60 days of the issuance of this Opinion for NMFS review and approval." The Opinion also contains Reasonable and Prudent Measures (RPMs) and Terms and Conditions (T&C) that are to be "developed in coordination with the action agency and applicant, if any, to ensure that the measures are reasonable" (USFWS & NMFS, 1998).

Entergy provided a draft monitoring plan as specified in the Opinion for NMFS review on 29 March 2013. NMFS and NRC participated in a site visit, intake tour, and meeting at IPEC on 11 June 2013 to discuss the draft monitoring plan. NMFS provided comments, dated 23 October 2013, on this draft monitoring plan in a letter to Ms. Dara Gray of Entergy. We understand that these comments also reflect NMFS' coordination with NYSDEC. This Revision 1 of the draft monitoring plan responds to these comments.

1.2 Description of IPEC and Operations Relevant to the Proposed Monitoring Plan

Entergy Nuclear Operations, Inc. (Entergy) currently operates two NRC-licensed pressurized water reactors and associated generating units at Unit 2 and Unit 3 (IP2 and IP3; collectively, IPEC). These units condense the steam exiting the turbines by transferring heat to water withdrawn from the Hudson River, which is then discharged back to the river. Maximum cooling water flow is 840,000 gallons per minute (gpm) at each unit (Enercon 2010).

Both IP2 and IP3 also use once-through systems to manage auxiliary heating loads, referred to as service water systems. These service water systems at IP2 and IP3 are significantly smaller than the cooling water systems, with maximum (design) service water flow of 30,000 gpm at IP2 and 36,000 gpm at IP3 (Enercon 2010), although service water flows are typically 15,000 gpm or less for each unit. The cooling water system for Unit 1 IP1 was originally designed to provide 280,000 gpm before the generating unit was retired in November 1974. The cooling water pumps at the IP1 intake were removed in the 1990s, but

the IP1 service water system is still operational and provides up to 16,000 gpm of supplemental service water for IP2 when needed.

1.2.1 Cooling Water Intake Structures

Cooling water for IP2 and IP3 is obtained through their respective cooling water intake structures (CWISs), located approximately 700 feet apart along the eastern shoreline of the Hudson River at approximately Hudson River mile 41.8 (41.8 miles upstream from the southern end of Battery Park in lower Manhattan, New York City). The CWISs are located within IPEC's federally mandated Safety and Security Zone (S&SZ).

The IP2 intake structure is located north of the IP1 intake and contains seven bays or channels which are separated by 3-foot thick concrete walls (Figure 1-1). Each intake bay at IP2 is equipped with a debris wall at the outer (western) side that extends to a depth of -1 foot at mean sea level as measured at the CWISs (i.e., "plant MSL"). A vertical bar rack, or trash rack, with 3-inch open spaces between bars, is also located at the outer (western or upstream) side of the IP2 intake bay to prevent large pieces of debris from entering the structure. The trash racks extend the full height of each IP2 intake bay opening (-27 feet to -1 foot plant MSL) (Figure 1-2). One optimized traveling screen is located at the inner (eastern or downstream) side of each IP2 intake bay. The chamber between the outer trash rack and the inner traveling screen is referred to as the forebay. Therefore, the submerged (at plant MSL) dimensions of each forebay at IP2 from the outer trash rack opening to the centerline of the traveling screen are 28 feet high by 13.3 feet wide by 11 feet long. Design velocities through the trash racks for the six cooling water intake bays range from 0.5 to 0.8 fps depending on pumping rate and tide height (Enercon 2010). Design velocity through the trash rack protecting the service water bay in the center of the intake structure at IP2 ranges from 0.06 fps to 0.17 fps (Enercon 2010). The design of the intake with the top of the trash rack submerged 1 foot below plant MSL and near the opening of each intake bay minimizes the buildup of debris on the trash racks, and there is no need for a mechanized cleaning system.

The IP3 intake structure, located south of the IP1 intake, consists of a concrete structure with nine openings which provide flow into a common plenum (Figure 1-3). The seven openings along the outer (western) side of the IP3 intake structure are each equipped with a debris wall and vertical trash rack similar to those at IP2 (Figure 1-4). Partition walls begin to isolate each of the cooling water pumps near the traveling screens, which are 18 feet inward (east) of the vertical trash racks and common plenum at the IP3 CWIS (Figure 1-4). Therefore, the submerged (at plant MSL) dimensions of each forebay at IP3 from the outer trash rack opening to the centerline of the traveling screen are 28 feet high by 13.3 feet wide by 18 feet long. Design velocity through the trash racks is 0.5 fps to 0.9 fps depending on cooling water flow rate and water level (Enercon 2010). Actual velocities through the seven trash racks is less than the design value because there are two additional openings, one at the north end and one at the south end of the structure (Figure 1-3). These openings contain additional trash racks. As at IP2, debris accumulation on the trash racks at IP3 has not been an issue because the racks are submerged 1 foot below plant MSL and are located at the outer edge of the intake structure. The design of the IP3 intake structure makes it possible for fish that pass through the trash racks associated with any of the seven openings on the

western side of the structure to swim within the structure parallel to the traveling screens and exit the structure through the openings at the north and south ends.

The IP1 intake structure is located between the IP2 and IP3 intakes (south of IP2 and north of IP3) behind a pile-supported dock (Enercon 2010). Since IP1 ceased power generation in 1974, the cooling water pumps have been removed, and the intake is now used seasonally to supply service water to IP2, when needed. The IP1 CWIS was originally outfitted with four trash racks at each of four intake bays, which were arranged in two sets of two bays each. However, the trash racks at the IP1 CWIS have not been maintained since power generation ceased, and our expectation is that they have substantially degraded since 1974. The IP1 CWIS originally had four conventional traveling screens, but these were also removed after power generation ceased and were replaced with a single 0.125-inch mesh dual- flow screen located within the service water portion of each of the two intake bays at IP1. Each of the two dual flow traveling screens at IP1 has a design through-screen velocity estimated as less than 0.5 fps, and thus is considered to be the best technology available (BTA) for reducing impingement by USEPA in their proposed regulations of cooling water intake structures at existing facilities (40CFR §125.94(b)(2) (28 March 2011).

1.2.2 Cooling Water Flow Management

The dual speed cooling water pumps at IP2 and variable speed cooling water pumps at IP3 were installed in the mid-1980s to minimize impingement and entrainment of fish by reducing the amount of water used for cooling (Enercon 2010). Since the amount of water needed for efficient operation varies seasonally with the river temperature, cooling water flow is reduced as much as 25% during winter months when river temperature is at its annual low. Lower flow rates not only reduce the amount of water withdrawn, but also reduce the intake velocity, facilitating escapement of fish that otherwise might be susceptible to impingement.

At IP2, each of the six of the cooling water bays provides water to an individual cooling water pump, which is located 35 feet behind the traveling screens. At the maximum pumping rate (140,000 gpm per pump), the maximum (at mean low water) average through-screen velocity for the IP2 traveling screens is calculated as 1.6 fps (Enercon 2010). The IP2 cooling water pumps can also be operated at 84,000 gpm, which proportionally reduces the calculated maximum average through-screen velocity to 1 fps. For the service water intake bay at IP2, the calculated maximum through-screen velocity is 0.35 fps when all six service water pumps are operated at a maximum (design) capacity of 30,000 gpm.

The six IP3 cooling water pumps, each enclosed in an intake bay and located 28 feet behind the traveling screens, have a continuously variable capacity between 70,000 gpm and 140,000 gpm. Three of the bays are also equipped with 3,200 gpm screen wash pumps. The seventh bay, located in the center of the structure, provides water to the six service water pumps, which have a maximum combined capacity of 36,000 gpm. As at IP2, the maximum average through-screen velocity for the cooling water bays is calculated as 1.6 fps (Enercon 2010), and is 0.4 fps for the service water bay.

The dual-flow screens in the IP1 intake filter the water drawn by the single 16,000-gpm service water pump and the two 1500-gpm spray wash pumps in each of the two intake bay sets. The screens are washed automatically when water level differences between the front and back of the screens exceed predetermined settings. Materials removed from the

traveling screen mesh are sluiced to the Hudson River in the wash water flow. During normal operation only one of the two service water pumps and two of the spray wash pumps is in operation at any given time at IP1(Enercon 2010).

1.2.3 Optimized Ristroph-Type Traveling Water Screens

The IP2 and IP3 intakes are outfitted with optimized Ristroph-type traveling screens and fish handling and return systems. The Ristroph-type screens and fish return systems were operational at IP3 in 1990, and at IP2 in 1991, following a collaborative research, design, and validation effort among the former owners of IP2 and IP3, the New York State Department of Environmental Conservation (NYSDEC), and the then scientific advisor to the Hudson River Fisherman's Association (HRFA, now Riverkeeper).

The Ristroph-type screens are located between the trash racks and the cooling water pumps at the CWIS and have the following features to protect the aquatic organisms impinged:

- **Dual-speed continuous rotation -** The screens are rotated continuously. Under low debris loading conditions, the screens are rotated at 2.5 fpm and under high debris loading at 10 fpm. Impingement on the screens and mortality of those organisms that are impinged is less likely to occur when low through-screen velocities are maintained by the continuous removal of debris. Continuous rotation also minimizes the time that impinged organisms are retained on the screen panels or in the fish buckets. These features significantly reduce the potential stress on impinged organisms.
- **Smooth screen mesh -** The 0.5 inch × 0.25 inch clear opening slot mesh on the screen panels is smooth, to minimize abrasion to fish transferred into the fish return systems.
- **Flow deflector lip on fish buckets -** The curved lip at the leading edge of the fish buckets is designed to minimize vortex stress on fish inside the buckets. The lip eliminates turbulent flow in the interior of the buckets and provides sufficient water depth to allow fish to maintain a stable, upright position (Fletcher 1985).
- **Dual-pressure spray wash systems -** The screens encounter a series of spray washes in the operating rotation. First, high-pressure sprays are used to remove debris from the screen mesh surface. During this process, deflector plates are used to protect aquatic organisms in the fish buckets. Low-pressure sprays are then used to gently remove aquatic organisms from the fish buckets for release through the fish return system. Finally, another series of high-pressure sprays are used to wash off any remaining debris to prevent "carryover" into the intake bays and assist in maintaining the available open area of each screen panel to reduce the potential for impingement.

The current fish handling and return systems at IPEC also incorporate several design features specifically selected to enhance the survival of impinged fish that are returned to the river:

- Separate fish return and debris return systems are provided.

- Fish return systems have smooth surfaces and gentle transition sections to minimize the potential for fish abrasion during transport.
- Design water depths are maintained to allow the fish to remain in a stable, upright position during transport.
- Design trough and sluice water velocities are maintained between 2 fps and 5 fps, which are sufficient to transport the organisms back to the river while minimizing stress during transport.
- Return pipe discharge locations were selected following dye and fish release studies to minimize the potential for re-impingement.

Collectively, the optimized Ristroph-type screens and the fish return systems, both developed through the extensive collaborative process referenced above, reflected first-in-kind design when installed, and continue to reflect state-of-the-art design today. The effectiveness of the modified Ristroph-type screens in reducing impingement losses was demonstrated in studies showing the technology to be fully optimized as BTA for impingement (Fletcher 1990), a conclusion supported by the inclusion of the IPEC configuration as BTA for impingement on a nationwide basis (USEPA 2011).

Entergy proposes to continue operating IPEC using this system for the duration of its operating licenses, or until a different system is determined to be BTA for the IPEC facility as a result of a final NYSDEC determination and the alternative system can be permitted, constructed, and installed.

2.0 Monitoring Program

The implementation schedules for monitoring (1) trash racks, (2) intake bays, (3) the traveling screens, as well as (4) collecting ancillary data associated with sturgeon occurrences, are set forth in the program components below (with references to the specific section of the Opinion in which the program element is specified).

2.1 Monitoring at Trash Racks

Monitoring sturgeons at the trash racks is specified by RPM#1, and T&C#s 1.a, 1.b, and 1.c of the Opinion. The pilot study described in Section 2.1.2 below will be performed during the first year, coincident with weekly inspection of all trash racks scheduled for two consecutive days per week. In subsequent years, the inspection frequency for "routine" trash rack monitoring (Section 2.1.3) will be based on analysis of the pilot study data describing the seasonal variation in sturgeon degradation rates.

2.1.1 IP2 and IP3

The main focus of trash rack monitoring is on moribund or dead sturgeon, which would be collected on the trash racks as they are carried with the current, likely with other debris. Specifically, since sturgeon large enough to become impinged on the trash racks are also large enough to easily avoid or overcome the intake approach velocity at the trash racks, the only sturgeon likely to be found against the trash racks are those that died before encountering the IPEC intake and drifted against the trash racks in the intake flow.

It is expected that this collection of dead sturgeon on the trash racks will be extremely infrequent because (1) sturgeon large enough that they could not fit through the trash racks (i.e., those greater than 3 inches in limiting body width dimensions, or approximately 600 mm total length) would have few predators and low natural mortality rates, and (2) closure of the shad fishery in the Hudson River has eliminated the fisheries by-catch mortality that was the likely source of many previously observed sturgeon impingements at IPEC.

An inspection of the IP2 and IP3 CWIS was recently (5 November 2013) performed by IPEC's engineering staff to determine if there are feasible access points to assess collection at the trash racks at IP2 or IP3 from the bulkheads and decks of the CWISs without significant civil or structural modifications, or the need to significantly modify the security system in these areas. The inspection revealed deck-level access through narrow slots providing clearance to the water immediately upstream and downstream of the trash racks at IP2 and IP3. At IP2, there was access to the top of the trash racks with about two feet of clearance upstream (outward), and about 5 to 7 inches of clear space downstream (inward) between the concrete bulkhead deck and each vertical trash rack (Figure 2-1). At IP3, welded metal floor plates cover these trash rack slots, but access to the top of the trash racks could be gained from the bulkhead deck level by modifying these plates to provide similar access to the upstream and downstream sides of the trash racks as was observed at IP2.

2.1.2 Pilot Study at IP2 and IP3

IPEC proposes to conduct a pilot study using low-light underwater cameras to detect and determine degradation rates and retention times of dead sturgeon on the trash racks at IP2 and IP3, and allow the field crew to refine our proposed methods for detecting and removing sturgeon from the trash racks.

Published studies on the degradation rates of dead fish suggest that complete degradation occurs from 6 to 34 days after winter kill for a mixed community of freshwater fish >150 mm total length (TL) in a Michigan lake (Schneider 1998), and averaged 10 days for post spawning dead anadromous clupeids (*Alosa* sp., mostly blueback herring, *Alosa aestivalis*) in the James River, Virginia (Garman 1992). Given the toughness of the sturgeon integument relative to that of most freshwater fishes or clupeids, we would expect the time for complete degradation of dead sturgeon impinged on the trash racks at IPEC to exceed that observed in the James River and in Michigan. Nonetheless, the proposed pilot study allows empirical determination of the degradation rate of sturgeon impinged on the trash racks at IPEC, and how degradation varies as water temperatures and scavenger densities change among four seasons.

White Sturgeon (*Acipenser transmontanus*) carcases between 600 mm total length (TL) and 1000 mm TL will be purchased freshly frozen from a commercial hatchery caviar operation and used as surrogate test subjects for this pilot study. Each test White Sturgeon will be thawed to ambient water temperature, placed in a mesh bag made from knotted multifilament gill net twine (1.5 inch square mesh), and tethered onto the upstream side of one randomly selected trash rack at IP2 and IP3. Each test White Sturgeon will be placed within one grid square randomly selected from nine grid squares of equal size across the western (upstream) face of one randomly selected trash rack at IP2 and IP3. Each test White Sturgeon will be deployed at the selected trash rack location by the field crew using a long-handled pole while standing from the bulkhead deck. This pole is in 8-foot long sections

that can be screwed together or telescoped to extend the full depth of the selected trash rack, and has a locking "noose" on the terminal end to deploy or retrieve fish (Figure 2-2). Direct observations of the condition of the test White Sturgeon on the trash racks at IP2 and IP3 will be made over the next 21 days or until the test White Sturgeon has completely degraded in less than 21 days. Observations of each test White Sturgeon will be recorded by deploying a low light digital underwater camera (SplashCam Deep Blue Pro) and underwater light LED source (Figures 2-3, 2-4, and 2-5) mounted on a second long pole with guides that slide up and down the trash racks from the CWIS bulkhead deck through the trash rack slot.

The pilot study will be conducted by placing one test White Sturgeon in one randomly selected grid square on the upstream face of one randomly selected trash rack at each of IP2 and IP3 on Day 1. Each test White Sturgeon deployed on Day 1 will be observed and the condition will be recorded (without removing the test fish) by the pole-mounted underwater camera system once per day on each of the next seven consecutive days (Day 2, Day 3, Day 4, Day 5, Day 6, Day 7, and Day 8) during the first pilot study test week. If the test fish has not degraded after seven consecutive days of observations, the fish will be allowed to remain tethered to the trash rack and observations will be made twice per week for the next two weeks by the regularly scheduled "routine" trash rack monitoring as described in Section 2.1.3 below (i.e., Day 11, Day 12, and Day 19, and Day 20) until the fish has completely degraded or the pilot test is terminated on Day 22 after 21 days of soak time. The pilot study will repeated once per season for a total of four studies during the first year.

Test White Sturgeon remaining after the 21 days of pilot testing will be removed from the trash racks using the telescoping pole and recovery noose, aided by direct observations from the low light camera, to guide the recovery noose around the test fish. Recovery of the test White Sturgeon with the pole and noose rather than simply retrieving the test fish using the mesh bag and rope tether is intended to provide training for the crew to deploy both the camera and recovery device. Wild Atlantic or Shortnose Sturgeon, if any, observed by the pole-mounted camera during each pilot study will be removed using the recovery noose as described above and processed as described in Section 2.4 below.

Compiling and analyzing the results from the four pilot study test periods in the first year will determine the appropriate observation interval for sturgeon on the trash racks at IP2 and IP3 for routine monitoring in subsequent years.

2.1.3 Routine Trash Rack Monitoring at IP2 and IP3

Routine trash rack monitoring at IP2 and IP3 will be conducted with the same pole-mounted low light digital underwater camera (SplashCam Deep Blue Pro) and underwater light LED source described above for the pilot study. The frequency of routine monitoring during the first year will be two consecutive days per week (i.e., Monday and Tuesday). Data from the pilot study of sturgeon degradation rates and first year observations will be analyzed and used to establish an appropriate and efficient sampling frequency in the second and subsequent years of trash rack monitoring. Sampling from the CWIS bulkhead decks and not by boat as originally proposed in the first Study Plan dated 29 March 2013 should help insure that few or no trash rack observations are missed due to extreme weather conditions such as river ice, thunderstorms, hurricanes, or storm surges. On each of the scheduled two days of trash rack monitoring during the first year, all trash racks at IP2 and IP3 will be

inspected using the pole-mounted camera system. Atlantic or Shortnose Sturgeon observed by the pole-mounted camera during a complete scan of the upstream face of each trash bar rack at IP2 and IP3 will be removed using the recovery noose as described above, and processed as described in Section 2.4 below.

2.1.4 Pilot Study and Routine Trash Rack Monitoring at IP1

Given the absence of intact trash racks at IP1, no pilot study or routine trash rack monitoring is proposed.

2.1.5 Trash Rack Monitoring Implementation Schedule, Modifications, and Permits

The pilot study for trash rack monitoring at IP2 and IP3 will be implemented within 270 days of final approval of this monitoring plan by NMFS. The use of low light underwater cameras to monitor the trash racks as proposed will not require any major modification to IPEC's intake structures that would need NRC or NYSDEC approvals before implementation. A modification will be required at IP2 and IP3 to allow access to the tops of the trash racks from the CWIS bulkhead deck at IP2 and IP3 for deployment of the camera and fish recovery devices. In addition, prior to implementation of trash rack monitoring, IPEC will need to provide the necessary safety and security clearances for the field crew to deploy the cameras through the trash rack slots at IP2 and IP3.

2.2 Monitoring in Forebays

The Opinion requires monitoring for and removal of sturgeons from the intake forebays (i.e., the spaces between the trash racks and the traveling screens) in RPM#1 and T&C#s 1.d, 1.e, and 1.f. There are several reasons why this requirement is not reasonable to implement at IPEC, or warranted. First, any live sturgeon in the forebays will either swim back out into the river voluntarily through the trash racks or they will be collected on the continuously rotating Ristroph screens and released back into the river via the fish return troughs, making their removal from the forebays unnecessary. Second, this location is very difficult to access without major structural modifications and is a "confined space" posing safety issues for anyone working within it. Third, detection of sturgeon within the forebays using imaging sonar technology would not work well in this confined space due to interference from the structures with the sonar beams. Fourth, even if sturgeon could be detected, it would not be possible to capture and remove them in a way that would impose less stress than allowing them to either return to the river voluntarily or be collected on the Ristroph screens (a system proven to produce high survival rates).

Nonetheless, to address NMFS's request for "information on the length of time that sturgeon spend in the forebays" in the 23 October 2013 review letter, we propose to install a surveillance camera system through the downstream (forebay) sides of the trash rack slots at IP2 and IP3 (Figure 2-1) to observe sturgeon near the bottom within each of the forebays of IP2 and IP3 when the circulating water pumps are operating at those units. Due to the confined space and limited access, there is no feasible way to recover any sturgeon observed in the forebays of IP2 or IP3 by the camera systems.

Forebay monitoring will not be performed at IP1 because the IP1 CWIS no longer has intact trash racks to isolate the forebays.

2.2.1 Forebay Monitoring at IP2 and IP3

Sturgeon present in the forebays of IP2 and IP3 will be monitored with a Splash Cam SideWinder 360 low-light digital underwater camera and underwater LED light source (Figure 2-6 and Figure 2-7). One SideWinder 360 camera unit will be deployed in each of the six isolated forebays at the IP2 intake structure (six total cameras). Six SideWinder 360 cameras will also be installed for viewing the forebays at IP3, one just inside near each of the trash racks, to observe the common plenum forebay structure there.

The SideWinder 360 is a dual camera unit. One camera within the SideWinder 360 views horizontally with a 360 degree panning motion. The second camera looks straight down. Drift fins keep the camera from spinning when deployed from the reinforced video and power cable that would be extended down from the intake bulkhead deck to near the bottom in the IP2and IP3 forebays. A counter weight (downrigger ball) may be used if needed to keep the deployed camera and cable from drifting in the current towards the rotating traveling screen.

All six cameras at a unit (IP2 or IP3) will be connected to a single digital video recorder that is programmed to systematically and continuously sample the side-looking and down-looking SideWinder 360 cameras at five minute intervals. Five-minute recordings from each of the two viewing perspectives (horizontal or vertical) in each forebay will be labeled by location, sequentially arranged in time, and stored on the digital storage device (i.e., digital video recorder) using a Windows based software system designed for security surveillance systems (e.g., GeoVision DVR 16 Channel Analog Base i5 System Model PCPRO-GV16). Therefore, one hour of recorded forebay observations from IP2 will contain five minutes of 360° horizontal viewing followed by 5 minutes of downward looking images from near the bottom of the IP2 Screen 21 forebay, followed by the same pair of horizontal and downward 5-minute observations from Screen 22, and so forth for the Screen 23, Screen 24, Screen 25, and Screen 26 forebays. The next hour of recorded forebay observation data at IP2 will repeat the first hour sequence, and continue to do so continuously for each successive hour in each week of the year when the IP2 CWIS is operating. A similar set of forebay observations will be obtained from the six SideWinder 360 cameras deployed at the IP3 CWIS, and recorded on a second dedicated digital video recorder and software system.

The field crew present each week to perform trash rack monitoring (Section 2.1 above) and traveling screen impingement monitoring (Section 2.3 below) will download the recorded digital video data from IP2 and IP3 onto a removable hard drive or thumb drive and take the digital recordings to the office for processing.

Efficient processing of 24/7 video monitoring data from IP2 and IP3 will require specialized commercial software (e.g., FishTick by Salmonsoft) to help apportion the recorded images into two types of images: those with sturgeon present, and those when sturgeon are not present. The digital recordings with sturgeon present, if any, then will be examined to enumerate the frequency and number of observations of sturgeon from the forebays of IP2 and IP3, and whether the fish observed appear to be alive or dead. The success in identifying sturgeon, and their condition, will depend on water clarity, turbidity, and orientation of the fish in the camera field of view. Concerns associated with distinguishing multiple counts of the same fish over time from multiple fish counted over time will be addressed to the extent practicable. Sturgeon images identified will be carefully scrutinized

for the presence of any injuries or other unique identifying features that could facilitate resolving the sturgeon taxonomy and counts, where practicable.

2.2.2 Forebay Residence Study Implementation Schedule, Modifications, and Permits

The forebay monitoring study for IP2 and IP3 will be implemented within 270 days of final approval of this monitoring plan by NMFS. Monitoring the forebays at IP2 and IP3 as proposed will require minor civil modifications to the security plates at the top of trash rack slots at IP3. Since these minor modifications are the same as needed for the trash rack monitoring at IP2 and IP3, the process to secure the necessary approvals will run concurrently for both studies. In addition, prior to implementation of the proposed forebay residence study, IPEC will need to provide the necessary safety and security clearances for the fixed installation of the cameras through the trash rack slots to monitor the forebays at IP2 and IP3.

2.3 Monitoring at Traveling Screens

Monitoring, detection, and handling of sturgeons impinged on the traveling screens are required by RPM#1 and T&C#1.e of the Opinion.

As described in Section 1, IPEC's traveling screens meet USEPA's definition of Best Available Technology for reducing impingement mortality by (1) ensuring that aquatic organisms are retained on the screens for a very short time due to continuous rotation, (2) using modified "buckets" that provide a haven of stilled water protecting fish from turbulence before the screen rotates above the water, (3) having a specially designed wash system to remove organisms from the screens with a minimum of damage, (4) employing optimized return trough designs to eliminate damage during transit back to the river, and (5) releasing fish at locations selected to minimize re-impingement and predation. This entire system, designed and installed more than 20 years ago through the cooperative efforts of the IPEC owners, NYSDEC, and HRFA, minimizes mortality of fish and other organisms that interact with the traveling screens, if it is allowed to operate as designed.

Modifications to the system, and operation in a way that would ensure that all (as opposed to a representative sample of) sturgeon are detected, identified, and handled, will result in unnecessary mortality on many other species of impinged fish, particularly clupeids (herrings) and engraulids (anchovies), which are not as hardy as sturgeons. For this reason, we propose a sampling approach to this requirement that will permit accurate estimation of the levels of sturgeon impingement (Cochran 1977), while still allowing most other impinged fish to be returned rapidly to the river and minimize their mortality.

2.3.1 Traveling Screen Sluice Sampling

Consistent with the shared goal (by Entergy, NYSDEC, HRFA, and presumably also NMFS) of minimizing stress on all impinged fish (including sturgeon), sturgeon that are collected by the continuously rotated traveling screens will be sampled during three 24-hour sampling days per week at each operating unit during the first year of monitoring. In the second year, Entergy will examine the results from the first year to consider and discuss with NMFS whether a variable frequency sampling plan can be implemented in which that sampling effort is redistributed among seasonal sampling strata (Mattson *et al*. 1988) to better reflect the observed seasonality of sturgeon impingement. If the variable frequency

plan is not adopted, the year one methodology described below will be followed in year two.

To enable IPEC's fish handling and return system to convey live impinged fish promptly back into the Hudson River with minimal stress, impingement sampling will be scheduled for 24 consecutive hours (one sampling day) on the three selected sampling days per week. Instead of diverting 24-hours of sluice flow into one or more large collection tanks as described in our first study plan of 29 March 2013, impingement sampling will be accomplished by filtering the screen wash contents from all operating traveling screens at IP1, IP2, and IP3 through sampling nets inserted in the combined return sluices at each unit. At each unit, both the fish sluice and the debris sluice will be sampled. The field crew will continuously staff and monitor each collection net during all 24-hours of each sampling day to detect and remove each sturgeon shortly after it is collected (i.e., within one hour). A blocking net made of 3/8 inch delta mesh liner and an outer 1-inch knotted-twine chafing net will be inserted into each sluice and held in place by U-channel guides (Figure 2-8). A second blocking net, located in the same sluice but just downstream from the first, will insure that one net is always collecting the sluice flow contents while the other net is being cleaned of debris and checked for sturgeon.

As soon as a sturgeon is observed, it will be removed from the sluice sampling net and placed in a 150-gallon oval holding tank located on the deck level adjacent to the sampler for subsequent processing (Figure 2-9). The holding tank at each unit will be covered with a mesh panel to prevent fish escapement and deter predator access and supplied with a continuous flow of ambient (un-chlorinated) river water at a flow rate where the volume is replaced every 15 or 20 minutes (Kahn and Mohead 2010). Water temperature, pH, dissolved oxygen concentration, total residual chlorine, and total ammonia nitrogen will be monitored and recorded in the water of the holding tank(s) during each interval when one or more sturgeon are being held for processing. Since this revised study plan no longer proposes to divert sluice flow into large collection tanks, and instead proposes to use standard and commercially available holding tanks and practices recommended by NMFS, this revised study plan does not anticipate the need to provide the series of engineering drawings requested by NMFS in Section 2.3.3 of their letter of 23 October 2013.

Pairs of the sluice sampling nets will be installed and operated in the combined fish sluice and in the combined debris sluice at the north end of IP2 (Figure 2-10). The sluice sampling nets for IP3 will be installed in the elevated fish sluice and the elevated debris sluice at the south end of the screen house (Figure 2-11). The sluice sampling nets for IP1 will be installed and operated where the combined fish sluice and combined debris sluice exit at the southwest end of the screen house (Figure 2-12). All fish and debris collected during each sampling day will be examined for the presence of sturgeon, and any sturgeon found will be removed and processed as described in Section 2.4. During each scheduled sampling day the field crew will also systematically inspect the entire sluice system and water boxes at each intake structure for the presence of "resident" sturgeon and remove any sturgeon that were not washed through the system into the collection nets. The recovery location (sluice, water box, net) of each sturgeon will be recorded.

A batch of 36 dead White Sturgeon between 100 mm TL and 600 mm TL will be obtained from the same commercial caviar hatchery operation described above for trash rack residency tests (Section 2.1 above) and used to determine the collection efficiency of

impingement sampling with the sluice samplers. Each collection efficiency fish will be marked with a PIT tag and 18 tagged White Sturgeon will be introduced in random order in the forebay area near or on the ascending face of each of the six randomly selected Ristroph screens at IP2 or IP3 (3 fish per screen) on one randomly selected sampling date per month. The number of White Sturgeon recovered in the deployed sluice samplers compared to the number released will determine both the collection efficiency for each intake structure and the apportionment of these test sturgeon among the fish and debris sluices. Recovered test fish will be frozen and re-used in subsequent collection efficiency tests if not in a state of advanced decay.

Fish, other than sturgeon and debris, will be allowed to return to the river in the sluice flow downstream from the sampling devices without being processed, because previous studies have optimized the survival of these fish during development and testing of the Ristroph screens and fish return system at IPEC (Fletcher 1990). We have been advised by counsel that obtaining additional data describing the impingement abundance of fish species other than Atlantic and Shortnose Sturgeon, which is outside of NMFS' jurisdiction, will be addressed directly with NYSDEC within the SPDES permitting process.

2.3.2 Traveling Screen Monitoring Implementation Schedule, Modifications, and Permitting

Once NMFS has approved the final monitoring plan and NYSDEC has approved any modifications to the CWIS within its jurisdiction, there are certain other reviews required by IPEC to ensure that continued safe operation of IPEC is not jeopardized by the proposed CWIS modifications. Traveling screen monitoring is proposed to be implemented within approximately 270 days after the later of NYSDEC's approval of the monitoring plan and the associated changes to the design and operation of the Ristroph screen sluice system or the completion of the NRC-mandated modification review discussed below.

Traveling screen monitoring will require minor modifications of the NYSDEC-approved fish return systems to allow the deck grates or plating that cover the sluices to be removed or modified and the sluice samplers to be installed. Thus, NYSDEC's prior approval may be required before making these changes to IPEC's fish return system and its operation. Consultations will be held with NYSDEC during the finalization of the monitoring plan to obtain their necessary approval in advance.

Entergy also provided the following list of steps that likely will be required to install the sluice sampling systems at IP1, IP2 and IP3 in compliance with all applicable IPEC procedures:

- Obtain a Project Manager/Engineer and project team,
- Develop a Project Plan,
- Obtain detailed cost estimate and funding approval,
- Obtain plant approval from engineering change review group and other management committees, as needed,
- Develop an Engineering Request and Engineering Change,
- Develop a Risk Management Plan,

- Perform a 10CFR50.59 screening to determine if an NRC review is required (an NRC review is not likely to be required),
- Determine the actual screen wash flow rates to enable finalization of the size and design of the collection tanks,
- Perform an engineering structural analysis to ensure that flooring and underground utilities can support the weight of the sturgeon holding tanks at the chosen locations,
- Obtain a contractor,
- Procure the equipment,
- Develop IPEC operating procedures,
- Develop biologist Standard Operating Procedures (SOP), and
- Connect the completed system and test it,

2.4 Fish Handling Procedures

Any Atlantic or Shortnose Sturgeon collected will be processed as required under the federal Endangered Species Act following the stated RPMs and T&Cs of the Opinion.

2.4.1 Live Fish

All live sturgeon will be processed as specified in RPM#2 and T&C#3 of the Opinion by the procedures described in this section to check for previously applied tags, measure the length and weight, record any physical abnormalities, photograph, apply a passive-integrated transponder (PIT) tag in each untagged live sturgeon larger than 250 mm TL that was not previously tagged, collect a genetic sample, and release the specimen away from the intake via the existing fish return system.

Previously applied tags could include yellow USFWS Floy tags, Carlin-Ritchie disc tags, or PIT tags. A hand-held PIT tag reader will be used to examine for the presence of internal PIT tags. The tag type and number of any tags found will be recorded and the condition of the tag insertion site will be noted (whether healed or infected).

The total length (TL) will be measured to the nearest mm and the fish will be weighed to the nearest gram.

Any obvious external physical abnormalities, such as fin rot, will be recorded and photographed.

Photographs will also be taken of all sturgeon to provide verification of the species identification and condition. Digital photographs of each specimen will include a close-up of the eyes with a mm ruler for scale, a close-up of the mouth with a mm rule for scale, a close-up side view of the base of the anal fin to reveal the presence or absence of anal scutes, and lateral views of the left and right side of the fish.

Before a live sturgeon >250 mm TL is released it will be tagged with a PIT tag (if one is not already present and, if in the judgment of the field crew, doing so would not disable or kill the fish) to assess re-impingement and post impingement handling and tagging survival. The tag will be inserted with a large hypodermic needle under the third or fourth dorsal scute by first puncturing in a fleshy area and then positioning the needle to push up

underneath the scute. The fish will be scanned with the PIT tag reader and the tag number will be recorded.

A genetic sample will be collected by the procedures in Section 2.4.3 from all sturgeon collected and sent every six months to the NOAA archives in Charleston, SC.

Live sturgeon will be released in the screen wash flow through existing return sluices, which were designed to transport impinged fish to locations sufficiently deep and far enough from the intakes to avoid the thermal plume and the intakes.

2.4.2 Dead Fish

All dead sturgeon will be processed as specified in RPM#3 and T&C#4 of the Opinion. Dead sturgeon will be checked for previously applied tags. External criteria will be used to determine if a dead sturgeon was freshly killed or previously dead. Fish considered alive at the time of impingement will exhibit signs of life (body movement, opercular movement, etc.) or show indications of recent death (red or only slightly faded gill filaments; King *et al*. 2010). Fish considered dead prior to impingement will exhibit bodily decay, bleached gill filaments, or other signs of morbidity or death prior sample collection (King *et al*. 2010). The nature of observed external injuries will be described. Genetic samples will be collected by the procedures in Section 2.4.3 from all dead sturgeons that were not previously tagged. Dead specimens or body parts of Atlantic or Shortnose Sturgeon retrieved from the IPEC intakes will be photographed, measured, labeled with a unique sample number, and retained by freezing until delivered to a qualified individual (recommended by NMFS) annually to perform necropsies.

2.4.3 Genetic Samples

RPM#4 and T&C#5 of the Opinion requires that a genetic sample will be taken from any live or dead Atlantic or Shortnose Sturgeon collected that was not previously tagged. Genetic sampling procedures will follow the description in the Appendix provided with the Opinion. A new pair of latex gloves and a new scalpel blade will be used for each individual fish to avoid cross-contamination of genetic material. If obvious contamination is observed, that genetic sample will be discarded. A 1 cm^2 section will be cut from a pelvic fin and placed in a vial of 95% to 100% ethanol that has not been denatured with methanol or other chemical additives. The vial will be taped to prevent leakage, labeled with the sample number and fish identification number using a permanent marker, and sealed in a small Ziploc bag labeled internally and externally with the sample number. All genetic samples collected from alive or dead Atlantic and Sturgeon Shortnose observed while monitoring at IPEC will be accumulated in the field laboratory and shipped once every six months to the NOAA-NOS genetic tissue sample archive in Charleston, SC following the procedures specified in Section 2.6.3 below.

2.5 Ancillary Data

2.5.1 Temperature

RPM#1 and T&C#1.l of the Opinion specifies temperature measurements at the trash racks and at the traveling screens, at surface, mid-depth, and bottom for each unit when a take of either species of sturgeon is observed.

RPM#1 and T&C#1.l of the Opinion will be addressed by reporting the measured water temperature for each sampling event when a sturgeon of either species is observed on the trash racks or traveling screens at IP1, IP2, or IP3. A sampling event is defined as the time interval during which the sturgeon was collected. Measured water temperatures will be obtained from loggers (e.g., Onset TidbiT v2 Water Temperature Data Logger) installed in the fish and debris sluice of IP1, IP2, and IP3 at the locations of the sluice samplers that continuously measure water temperature and logs the values at 5-minute intervals. The number of valid temperature observations and the mean, standard deviation, maximum and minimum values will be reported for each sturgeon sampling event.

2.5.2 Water Velocity

RPM#1 and T&C 1.k of the Opinion specifies measuring actual water velocity at the trash racks (approach velocity and through the rack), in the intake forebays, and at the traveling screens (both approach velocity and through-screen velocity) at all three units "so that this information can be reported any time a take occurs." NMFS further clarified T&C 1.k in their letter of 23 October 2013 that their interest in these data is out of a concern for possible "hotspots" of high velocities at locations across one or more of the trash racks and traveling screens that render average velocities inaccurate for verifying the assumptions and conclusions of the Opinion. The velocity data requested by NMFS includes the high and low approach and through-screen velocities in each 2-foot square grid across the face of each trash rack and traveling screens representative of a range of tidal and weather conditions and actual pump operations that would bound all expected scenarios.

The intake velocity information sought by NMFS in RPM#1 and T&C 1.k of the Opinion, and further clarified in the 23 October 2013 letter, suggests that an empirical study may be required to obtain velocity data. However, robust modeling of velocity is now the norm and will produce more accurate information, and therefore is preferable as discussed below. Indeed, are many reasons why direct measurement of approach and through-screen velocity at the IP1, IP2 and IP3 CWIS's would be a futile effort:

1. Velocities at the IP1 traveling screens are already well below the 0.5 fps through screen value that USEPA considers sufficient to eliminate impingement concerns.
2. Due to the way that IPEC is operated, intake velocity is relatively constant. Although the IPEC pumps can pump at different rates (IP2 at 60% or 100%, IP3 at a continuum of 50%-100%), the amount of water needed at any given time is determined by the river temperature. Therefore pumping rates, and subsequently intake velocities, actually have little variation from one day to the next and are typically higher in the summer and lower in the winter.
3. Due to the design of the trash racks, their location at the outer edge of the IP2 and IP3 intake structures, the presence of skimmer walls, and the ecology of the Hudson River estuary, debris accumulation at the trash racks is insufficient to block flow and substantially increase velocities at either the trash racks or traveling screens. The trash racks and traveling screens also serve to straighten the intake currents that pass through them, thus reducing the variation in velocity across the ascending face of the Ristroph-type traveling screens. Trash racks are cleaned only twice per year, during a semi-annual inspection, which is

frequent enough to avoid high intake velocity incidents. The Ristroph-type traveling screens are cleaned continuously.

4. Sturgeon impingement events are not likely to be frequent enough to establish a meaningful relationship with velocity. Even if there is a large enough sample size, the low amount of flow variation will make establishing any relationship extremely unlikely.
5. It will not be possible to determine which traveling screens an impingement occurred on, therefore the exact velocity at the place of impingement cannot be determined.
6. The impracticality of continuous monitoring of sturgeon interaction with either the trash racks or traveling screens, and the herculean effort required to monitor velocity at all trash racks and traveling screens, would make it impossible to relate actual impingement events to a specific velocity.
7. Velocity will differ over the face of trash racks.
8. Measurements of actual through-screen velocity are not possible in the field for the continuously rotated traveling screens.

We propose to address the requirements of RPM #1 and T&C 1.k of the Opinion by using two existing nearfield Hudson River water current data sets to parameterize a computational fluid dynamics (CFD) model of the IP2 and IP3 CWIS's. The CFD model will then be used to describe the mean, standard deviation and range of approach and through-screen velocities at a resolution no greater than 1 square foot across the face of each trash rack and each traveling screen operated at IP2 and IP3 under a bounding range of tidal, river flow, weather and intake pump scenarios.

The velocity distribution at the trash rack and the traveling water screens can vary when the approach flow is not normal to the screen surface. At IPEC this occurs because of the river currents. The river currents will cause a higher through screen velocity skewed towards the downstream end of the trash rack. The skewed velocity profile can propagate through the forebay resulting in a skewed velocity distribution at the traveling screens. The skew in the velocity distribution is caused and proportional to the velocity component parallel to the screen surface.

One of several commercially available computational fluid dynamics models that exist will be applied to the proposed modeling effort (e.g., Fluent, by ANSYS; or FLOW-3D, by Flow Science). The two models are similar in that both solve the Reynolds Averaged Navier-Stokes (RANS) equations with options for various turbulence models to simulate the creation, transport and dissipation of turbulent kinetic energy. However, implementation of the governing equations differs; Fluent uses a boundary fitted grid and FLOW-3D uses a structured grid. The solver in Fluent is better suited to steady state simulations while the FLOW-3D solver is very efficient for unsteady (time-dependent) simulations. Both models have the ability to simulate the trash rack and the traveling water screens with a porous media approximation. We propose to use Fluent with a steady state approximation for an efficient modeling effort rather than FLOW-3D and an unsteady simulation.

The proposed model will extend from downstream of the traveling water screens to a distance of two to four intake widths into the Hudson River. Because the skew in the

velocity profile is expected to increase with increasing river currents (shear flow), the skew can be bounded without knowing exact river current magnitudes or direction. Shear flow will then be applied in the model without a need to model the cause of the shear flow. High resolution river bathymetry in front of the intake (Substructure 2010) will be used to describe the Hudson River bottom contours and substrate near the IP2 and IP3 CWISs.

The magnitude of the shear flow will be bounded using the existing ADCP data sets from two studies performed in the nearfield area of the Hudson River adjacent to IP2 and IP3 during 2010 (Normandeau 2011) and 2011 (Normandeau 2012). Typically river currents are slower near the shore than in the center of the river. A conservative estimate of the shear flow is to use the maximum observed velocities from the 2010 ADCP Stations 2A and 2B offshore near the IP2 CWIS and Stations 3A and 3B offshore near the IP3 CWIS (Figure 2-13). A less conservative estimate would use the measured ADCP velocities from in between the IP2 and IP3 CWIS's at the IP1 barge site from the 2011 study (Figure 2-13). To cover the range of possible maximum velocities, this model will use the maximum from all locations for the initial simulations. Skew in the velocity should also be more pronounced at lower intake pump flows that typically occur during the winter. Therefore, a bounding simulation for each model will be run with the minimum pumping flow.

Two models will be created, one for each of the IP2 and IP3 CWIS. Each model will include the actual trash racks and traveling screens and the relevant intake geometry. Each trash rack or screen surface will be modeled as a porous medium with either the observed or designed headloss characteristics of that trash rack or screen. The headloss characteristics will be obtained either from actual observations recorded by IPEC, or directly from the screen manufacturer. If sufficient headloss information is not available from either of these two sources, headloss will be estimated from the screen open area and screen design. Manufacturer's data is considered more reliable than the estimates. Each model will be run for the maximum upriver and downriver velocity resulting in four simulations to define the extreme case condition. Depending on model results, additional simulations may be used to simulate average river conditions or river conditions with a specific exceedence probability.

The velocity distribution three inches upstream of each trash rack and traveling screen will be post-processed to create plots that show the percentage of screen area on the horizontal axis and the velocity percentile above or below the nominal through screen velocity on the vertical axis. The plots will quantitatively show the skew in the approach velocity.

The trash racks and the traveling screens cause headloss which serves to create a more uniform velocity distribution through the screens. The velocity distribution on the surface of the screen can be used to estimate the variability in the through screen velocity. The distribution is considered an estimate because the model will not include every bar and every gap in the trash rack or the traveling water screens. Resolving each screen member is beyond the limitations of existing computational resources. However, the estimated through slot velocity is expected to be very reliable. Plots quantifying the variability in velocity distribution across each trash rack or traveling screen will be made. In addition to the quantitative plots described above, color contour plots will be created for each trash rack and screen colored by absolute velocity or by or a dimensionless velocity showing the velocity distribution.

IPEC has two data sets of continuously recorded nearfield Hudson River water currents available to be used to develop and validate the CFD model of the IP2 and IP3 intakes described above. These two data sets encompass the range of tidal and weather conditions, river flows, and pump operations that are representative of the Hudson River near IPEC. The first data set consists of more than 4.5 million data points of current velocity and direction obtained during five-minute periods from 0.5 m or 1.0 m vertical depth layers overlying four acoustic Doppler current profilers (ADCPs) deployed in the Hudson River near the IP2 and IP3 CWIS's during 4 March through 2 November 2010 (Figure 2-13). Water current velocity and direction were continuously monitored in each depth layer at four locations (Stations 2A and 2B offshore from IP2; Stations 3A and 3B offshore from IP3) throughout the overlying water column water to 1) evaluate the percentage of time that river currents of a particular velocity range equaled or exceeded designated current velocity increments, 2) determine the primary axes of current flow direction at each of the four Stations, and 3) determine frequency distributions of peak tidal current velocity data throughout the entire nine month monitoring period at each of the four Stations.

Two *in situ* upward-looking ADCPs were also installed on the Hudson River bottom at Stations 1S and 2N in close proximity to the IP1 pier (Figure 2-13) to continuously record river current velocity and direction throughout the overlying water column from 25 May through 26 September 2011. Water column turbulence data was also collected to provide actual field values of turbulence intensity for CFD modeling of the intake structures. The fixed position ADCPs measured and recorded the physical dynamics of the Hudson River currents in a data set consisting of more than 729,000 data points of current direction and velocity during five-minute intervals from 0.5 m and 1.0 m depth intervals throughout a 50 foot deep water column at the IP1 location, which is in between the IP2 and IP3 CWISs. This 2011 ADCP data set also includes approximately 58 million data points represented by bursts of water direction and velocity data obtained to measure turbulence at one-second intervals. Data recorded from this IP1 site are available for analysis from daily and tidal timescales down to one-second turbulence timescales, including velocity, direction, temperature, depth, and water surface elevation.

2.5.3 Plant Operating Data

RPM#1 and T&C 1.m of the Opinion requires that the plant operating conditions at each unit are documented for the previous 48 hours associated with each take, the field staff will contact the control room and obtain and record data provided by the plant operators regarding the number of circulating pumps operating.

2.5.4 Ancillary Data Collection Implementation Schedule, Monitoring, and Permits

Ancillary data collection will be implemented when sturgeon impingement monitoring is initiated. No NRC or State of New York approvals are required before implementation of ancillary data collection. No physical plant alterations are necessary to allow ancillary data collection to be implemented other than affixing the temperature loggers in the return sluices near the collection nets.

2.6 Reporting

This section describes procedures for reporting to NMFS all sturgeon incidental takes and sample transfers as required by RPM#5 and T&C#s 6, 7 and 8 of the Opinion.

2.6.1 Take Notification

NMFS will be notified within 24 hours of finding any live or dead Atlantic or Shortnose Sturgeon in association with the IPEC intakes as required by RPM#5 T&C#6 of the Opinion. The form for reporting each incidental take of any sturgeon (alive or dead) is shown in Figure 2-14.

2.6.2 Annual Report

An annual report of all incidental takes of Atlantic and Shortnose Sturgeon occurring at the IPEC intakes during each calendar year will be submitted to NMFS and NRC by 15 February of the following year as required by RPM#5 T&C#7 of the Opinion. The annual report will include any necropsy reports of specimens, all incidental take reports, photographs, a record of all sightings of Atlantic or Shortnose Sturgeon in the vicinity of Indian Point, conditions at the time of the take (IPEC operations as well as environmental conditions including water temperature and water flow), and a record of when inspections of the intake trash racks and Ristroph screens were conducted. The report will include a summary table of environmental sampling data in the format specified by NMFS (Figure 2-15). The annual report will also identify any potential measures to reduce Atlantic or Shortnose Sturgeon impingement, injury, and mortality at the intake structures along with any plans to implement those measures.

Following the submittal of each annual report and prior to 15 April of each year, Entergy will participate in a meeting or conference call with NMFS and NRC to discuss the take information of the prior year and any changes to the monitoring program that NMFS, NRC, or Entergy believes are necessary as required by RPM#5 T&C#8 of the Opinion.

2.6.3 Genetic Samples

As specified in the NMFS instructions for collecting, certifying, identifying, and shipping sturgeon tissue samples (Figure 2-16), each shipment of sturgeon genetic tissue samples will be accompanied by (1) a completed Certification of Species, Sample Identification, and Chain of Custody form for each fish (Figure 2-17); (2) a completed Summary Sheet for Genetic Tissue Samples form if the shipment contains multiple samples (Figure 2-18); (3) a completed NMFS Guidelines for Air-Shipment of "Excepted Quantities" of Ethanol Solutions form (Figure 2-19); and (4) a copy of the ESA permit authorizing the collection of the sample(s). Because the origin of impinged fish factors into the take limits specified in the ITS, Entergy requests to receive the results of the genetic analysis as testing is completed on each fish.

2.6.4 Dead Sturgeon or Sturgeon Parts

If any dead specimens of Atlantic or Shortnose Sturgeon are found in association with the IPEC intake sampling procedures specified in this monitoring plan, after they are processed as described in Section 2.4.2, NMFS may request transfer of the specimens to NMFS or to a NMFS-approved laboratory or researcher for necropsy. In addition to the take notification

form (Section 2.6.1), a Sturgeon Salvage form (Figure 2-20) will also be submitted to an individual or laboratory qualified to perform necropsies and recommended by NMFS, to document the disposition of each dead specimen.

2.7 Training of Field Biologists

Qualifications of all personnel who will be handling sturgeon will include previous training and experience in the implementation of NMFS Permit to Take Protected Species for Scientific Purposes Permit No. 17095 (and its predecessor, Permit No. 1580) for the Hudson River Biological Monitoring Program (HRBMP). All field personnel participating in the IPEC sturgeon monitoring will be required to read the SOP and will be provided with the appropriate training. Monitoring personnel unfamiliar with a task will be directly supervised by an experienced technician for at least the first two attempts and be subjected to 100% inspection of at least the first five samples analyzed independently.

2.8 QA/QC Procedures

The basis for all quality control (QC) and quality assurance (QA) monitoring of program activities will be the SOP, consisting of written documentation of sampling and data collection protocols. The SOP will be developed from the objectives and methods in the final monitoring plan approved by NMFS, and will be prepared before monitoring begins. The SOP will function to (1) insure that consistent and appropriate procedures are followed, (2) provide Entergy with documentation of the procedures used, and (3) enable a QA auditor observing program activities to determine whether the required procedures are being followed.

QC will be conducted continually by qualified project staff. All field observations and measurements of sturgeon (identification, length, weight, injury, condition, tag numbers, etc.) will be subject to a standard and appropriate QC and QA review based on a Military Inspection Standard (MIL-STD) inspection plan derived from MIL-STD 1235 Single and Multiple Level Continuous Sampling Procedures and Tables for Inspection by Attributes to achieve a 10% Average Outgoing Quality Limit (AOQL). QC re-inspections for these sample processing tasks will be performed according to the continuous sampling plan CSP-1 at the 10% AOQL level, to insure that at least 90% of samples satisfy the project's acceptance criteria. This level of quality meets or exceeds New York, industry-wide, and HRBMP standards for fisheries measurement data.

All final data files and reports will be subject to a standard and appropriate QC inspection to achieve a 1% AOQL so that the final data files will be certified through statistical inspection to document that less than one record (line of data) out of every 100 records will be in error. A QC inspection plan (CSP-1) will be used at the 1% AOQL level to insure that values of all variables in at least 99% of the data records provided in each data file correctly correspond to values coded on the original data sheets. This level of quality meets or exceeds New York, industry-wide, and HRBMP standards for fisheries data files.

At least one QA Audit of the field activities described in Sections 2.1 through 2.5 above will be performed per year to verify adherence to the technical protocols specified in the SOP and verify the effectiveness of the QC system. QA auditors will be technically qualified to evaluate the activities being observed but independent from the project team. The audits

will cover all activities described in the SOP, including transfer of data from field to completed data deliverables. The audit results will be documented in a written report for review by project management, Normandeau corporate management, and Entergy.

3.0 Literature Cited

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Figures

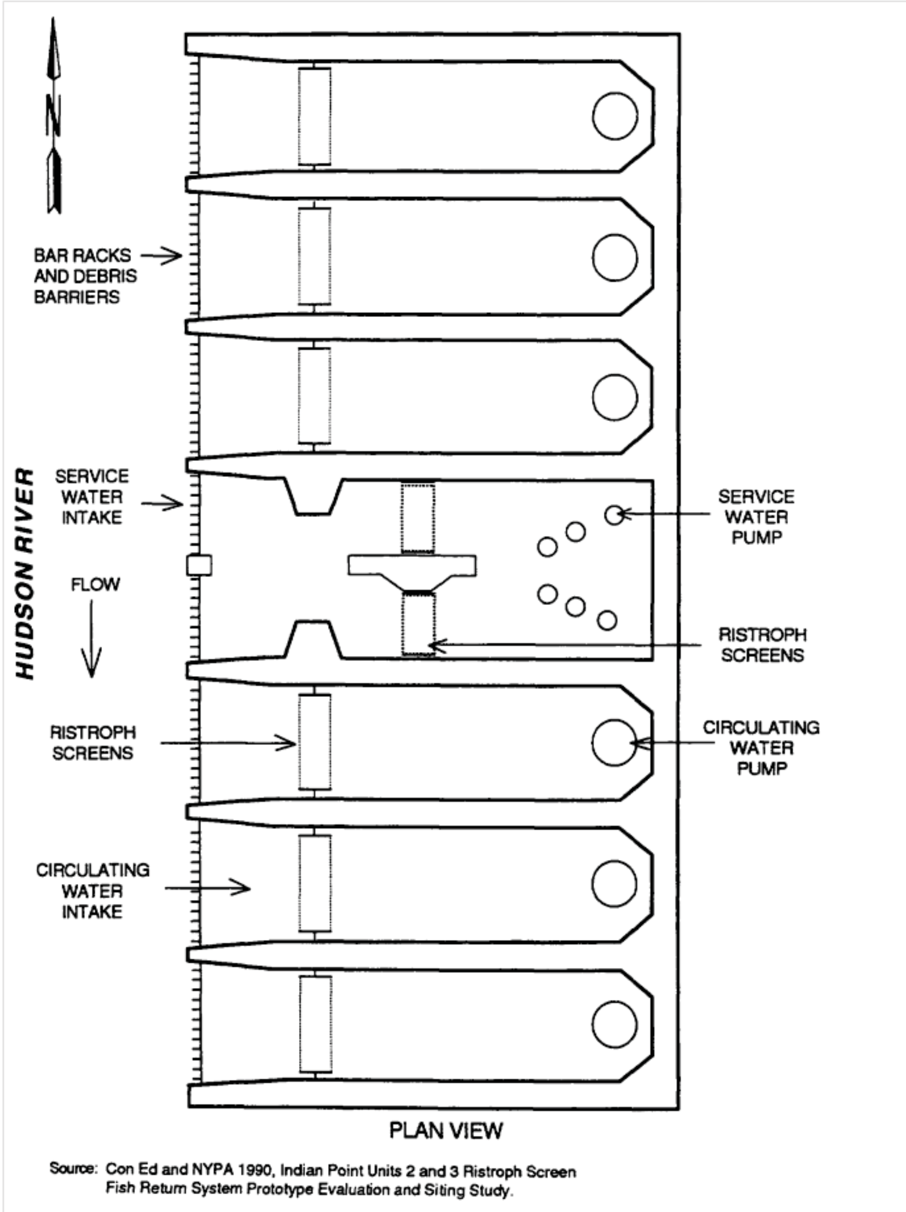


Figure 1-1. Indian Point Unit 2 (IP2) cooling water intake structure – plan view.

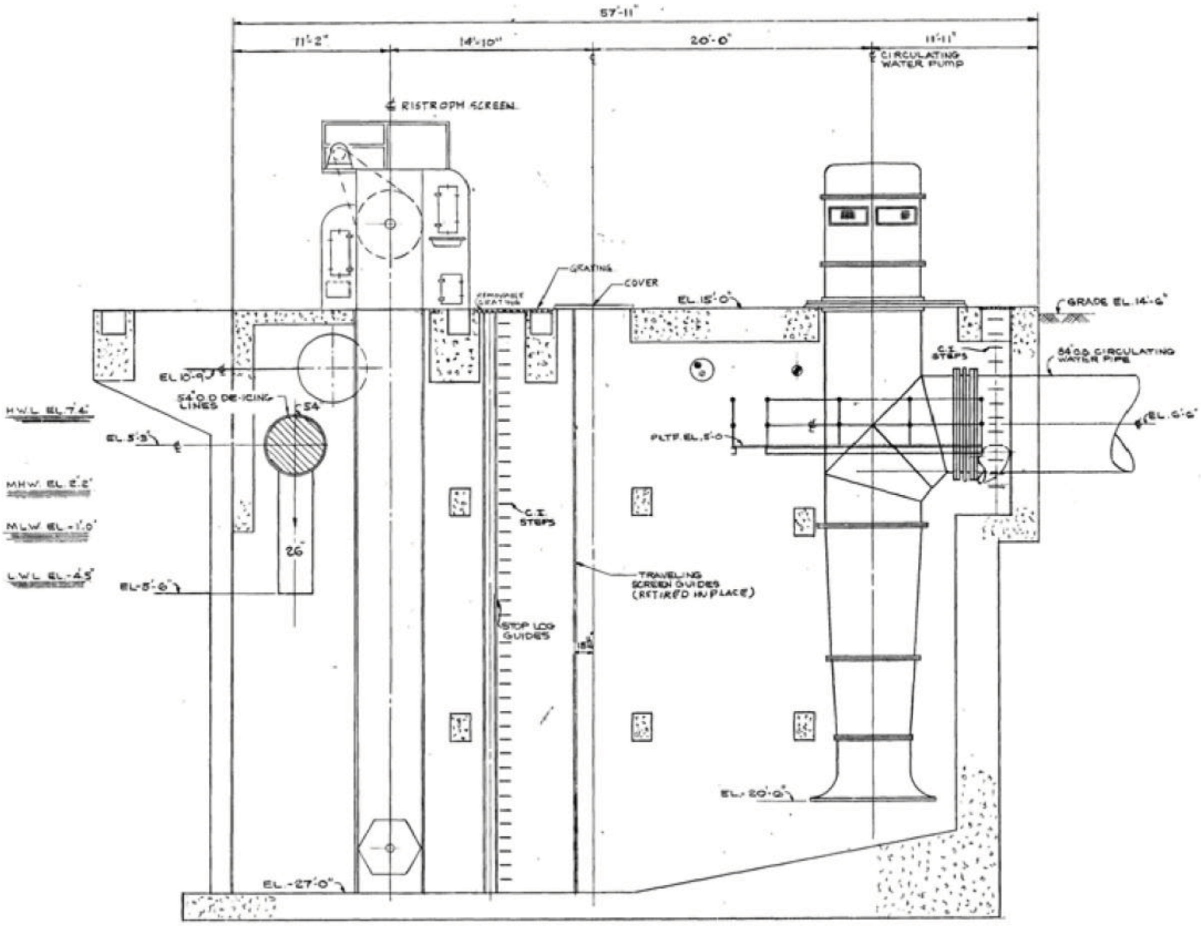


Figure 1-2. Indian Point Unit 2 (IP2) cooling water intake structure – sectional view.

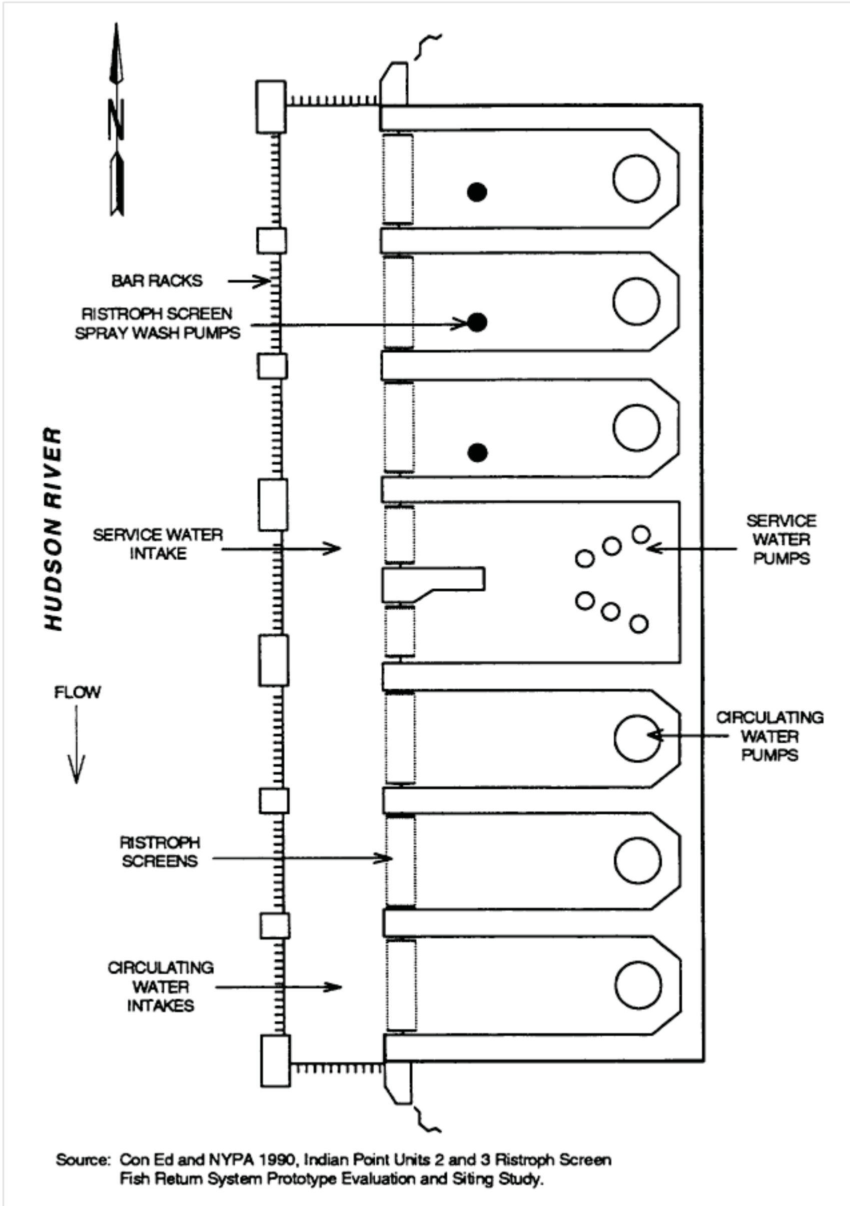


Figure 1-3. Indian Point Unit 3 (IP3) cooling water intake structure – plan view.

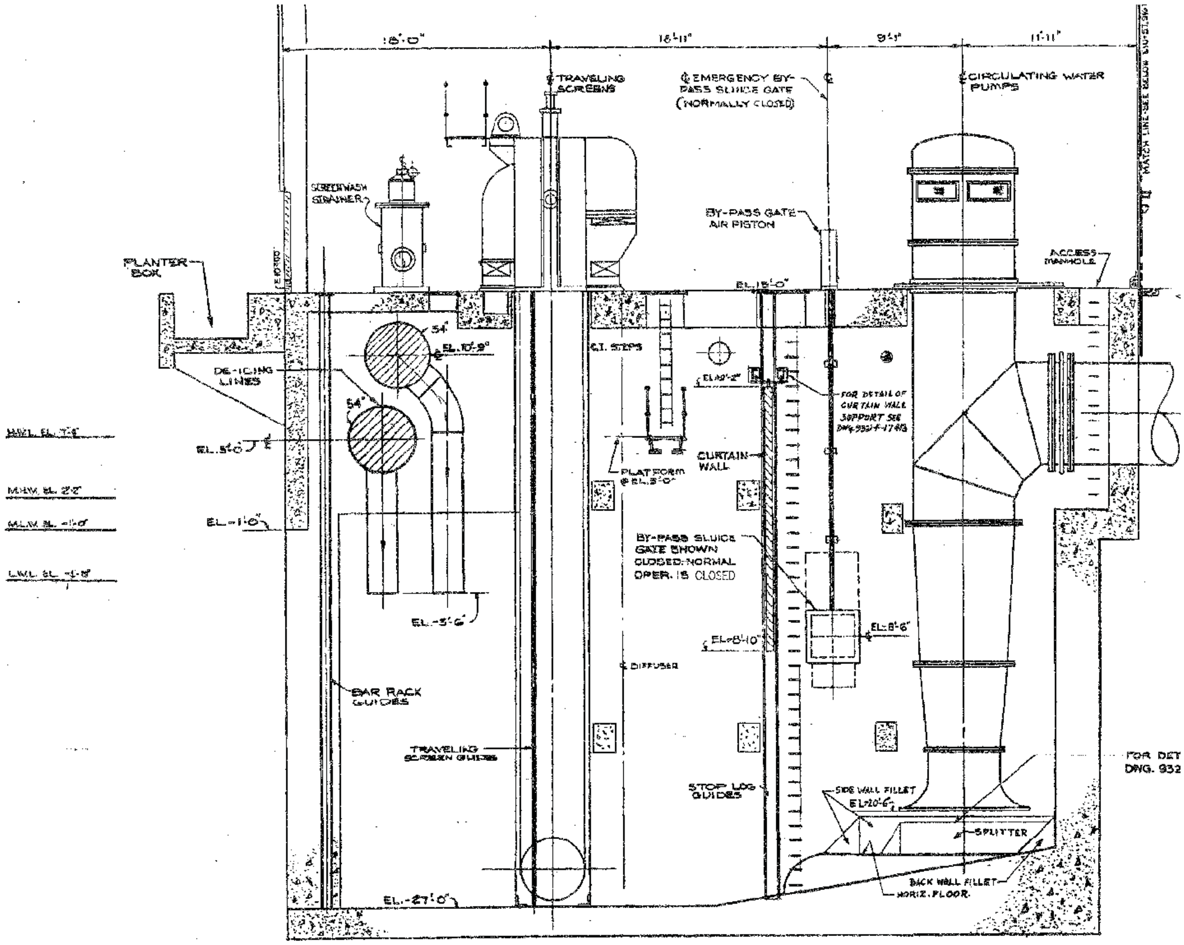


Figure 1-4. Indian Point Unit 3 (IP3) cooling water intake structure – sectional view.

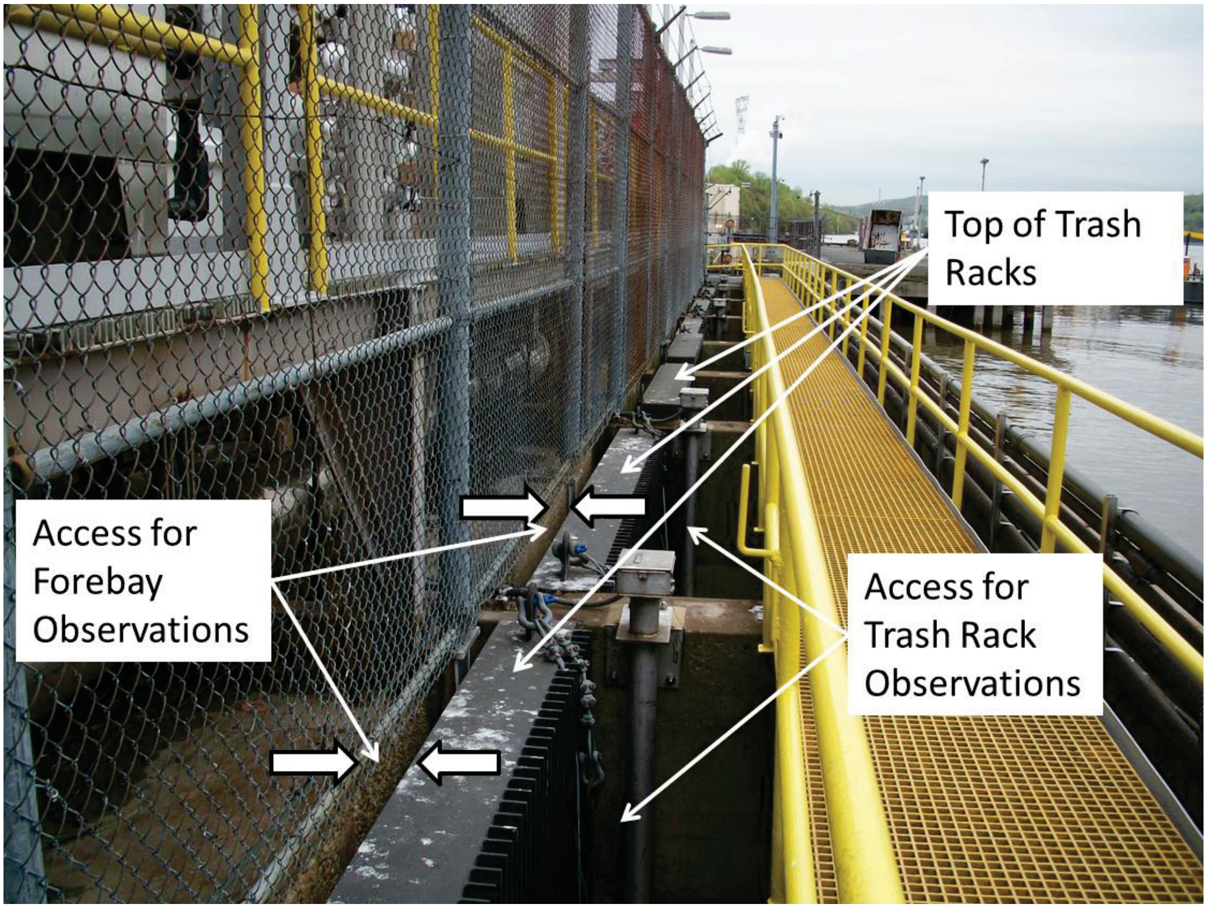


Figure 2-1. Trash rack slots at the outer (western) side of the IP2 cooling water intake structure.

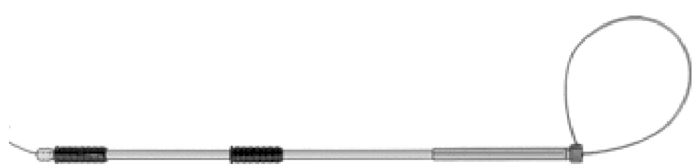


Figure 2-2. Telescoping pole with locking noose proposed to retrieve sturgeon observed on the outer side of the trash racks at IP2 and IP3.

Sturgeon detection by underwater video on the trash racks at IP2 and IP3:

- Ability to detect sturgeon directly related to turbidity of surrounding waters
- Previous studies and surveys have successfully identified sturgeon at depths of 30 feet or more, with water clarity of about 15 feet or less; and turbidity = 1.75 NTU or less (Bergman 2011) using video
- Splash Cam© Deep Blue Pro underwater camera http://www.splashcam.com/deepblue/db.htm
    - Approximately $1500
    - High resolution color picture
    - Low Light Operation
    - Virtually Indestructible Camera Housing
    - Military Grade Umbilical Cable (15 m standard)
    - High Bright LED Underwater Lighting
    - Easy Deployment / Recovery
    - Recessed Lens Will Not Scratch
    - No Installation Required, Fully Portable
- EverFocus ECOR 4D 465 GB DVR unit with GPS and time overlay and displayed in real-time on a 38 cm LCD monitor
    - DVR about $500
    - Monitor about $300
- Auxiliary removable light source
    - Underwater Lighting $90
    - Battery operated underwater 2.4 watt Xenon lighting pod. Depth rated to 500 ft. Allows for viewing of up to 15 feet from the camera in complete darkness.
    - P/N: LP-100DB - MADE FOR DEEP BLUE CAMERA

Figure 2-3. Low-light underwater camera system proposed for observations of trash rack impingement of Atlantic and Shortnose Sturgeon at IP2 and IP3.

Camera Specifications	
Video Output:	Composite NTSC (PAL Optional) - works with any video device with RCA video input
Focus:	Fixed 1 inch to focal infinity
Auxiliary Lighting:	High Intensity LED
Resolution:	520 TV Lines
CCD:	1/3" Sony Super HAD II
Pixel Array	768(H)X 494(V)
Lens:	3.6mm
Iris:	Electronic
Operating Temp:	-10 to 55C
Light Sensitivity:	0.1 lux
Input Voltage:	12 volts DC
Current Draw:	90 mA
Physical Specifications	
Body Construction:	Anodized Cast Aluminum
Exterior Finish:	Thermoplastic Paint
Camera Weight:	1.2lbs water / 2lbs air (Dive weight can be added)
Depth Rating:	800ft standard / 2000ft with upgrade
Cable Strength:	700lbs break strength / 250lbs nominal work load
Available Cable Lengths:	50-1000ft in 50ft. increments
Dimensions:	3" Dia. / 3.5" Length
Weight with 50ft Cable:	10lbs

Figure 2-4. Specifications of a Splash Cam Deep Blue Pro Video system for detecting Atlantic and Shortnose Sturgeon impinged at the IP2 and IP3 trash racks. Camera is shown mounted on auxiliary light source.

Figure 2-5. Example screen capture from a Splash Cam Deep Blue Pro video of a free-swimming white sturgeon at a depth of 6.7 m and turbidity of 1.75 NTU in the Yuba River, California, USA (Bergman, et al. 2011).

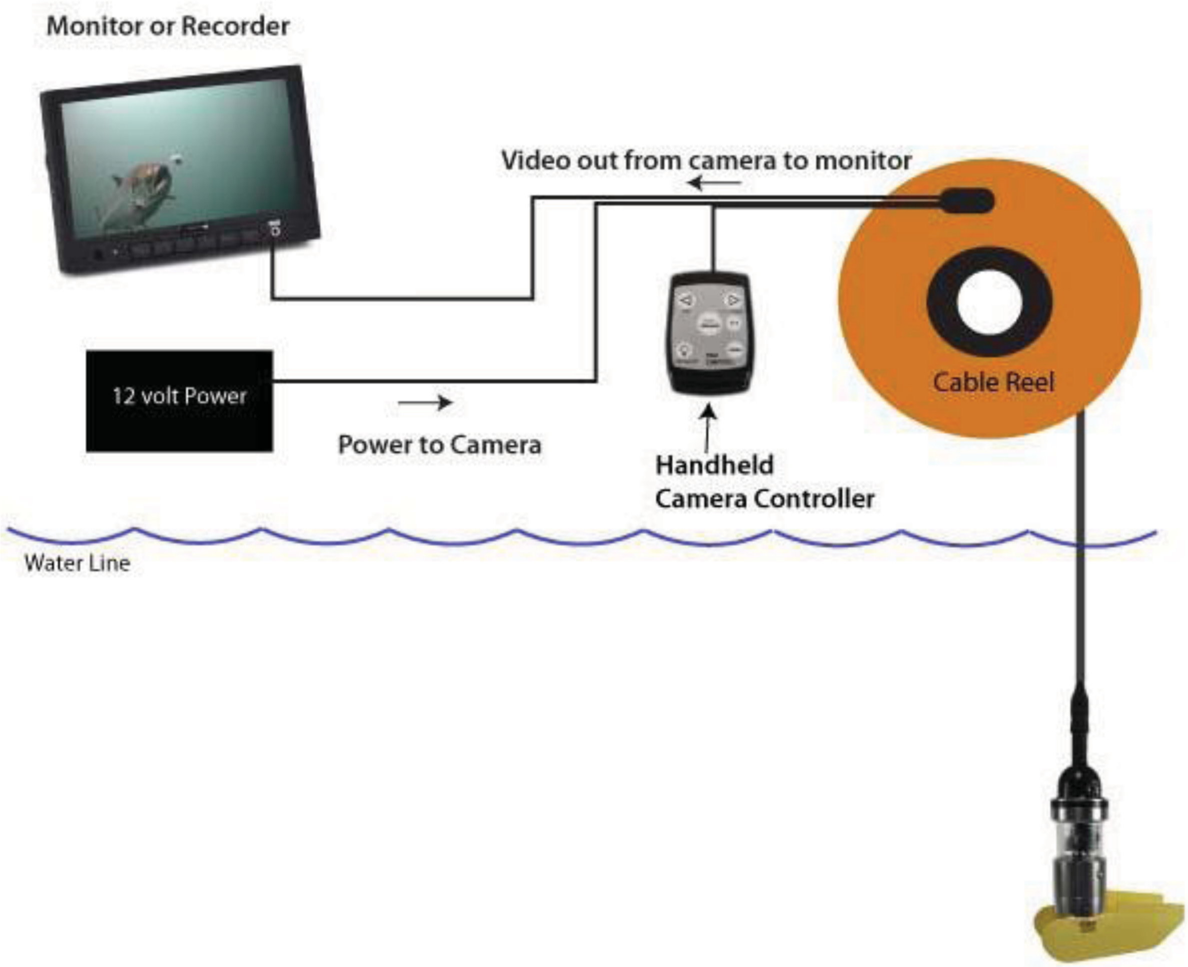


Figure 2-6. Low-light 360° panning underwater camera system (Splash Cam SideWinder 360) deployed with stabilizer fins for forebay observations of Atlantic and Shortnose Sturgeon at IP2 and IP3.

Camera Specifications	
Video Ouput:	Composite NTSC (PAL Optional) - works with any video device with RCA video input
Auxiliary Lighting:	High Intensity White LED
Resolution:	510 TV Lines
CCD:	1/3" Sony
Focus:	1.5" to Focal Infinity
Lens:	3.6mm
Iris:	Electronic
Operating Temp:	-10 to 55C
Light Sensitivity:	0.3 lux
Input Voltage:	12 volts DC
Current:	270 mA max.

Figure 2-7. Specifications of a Splash Cam SideWinder 360 dual underwater camera unit for detecting Atlantic and Shortnose Sturgeon in the intake forebays of the IP2 and IP3.

Physical Specifications	
Body Construction:	Stainless Steel / Acrylic
Camera Weight:	3.2lbs water / 4lbs air
Depth Rating:	450ft.
Cable Strength:	200lbs break strength / 50lbs nominal work load
Cable Length	290ft
Dimensions	10” H x 3” D

Figure 2-7. (Continued)

Figure 2-8. Example of a sluice sampling net and frame (without delta mesh liner).

Figure 2-9. Example of two 150-gallon sturgeon holding tanks.

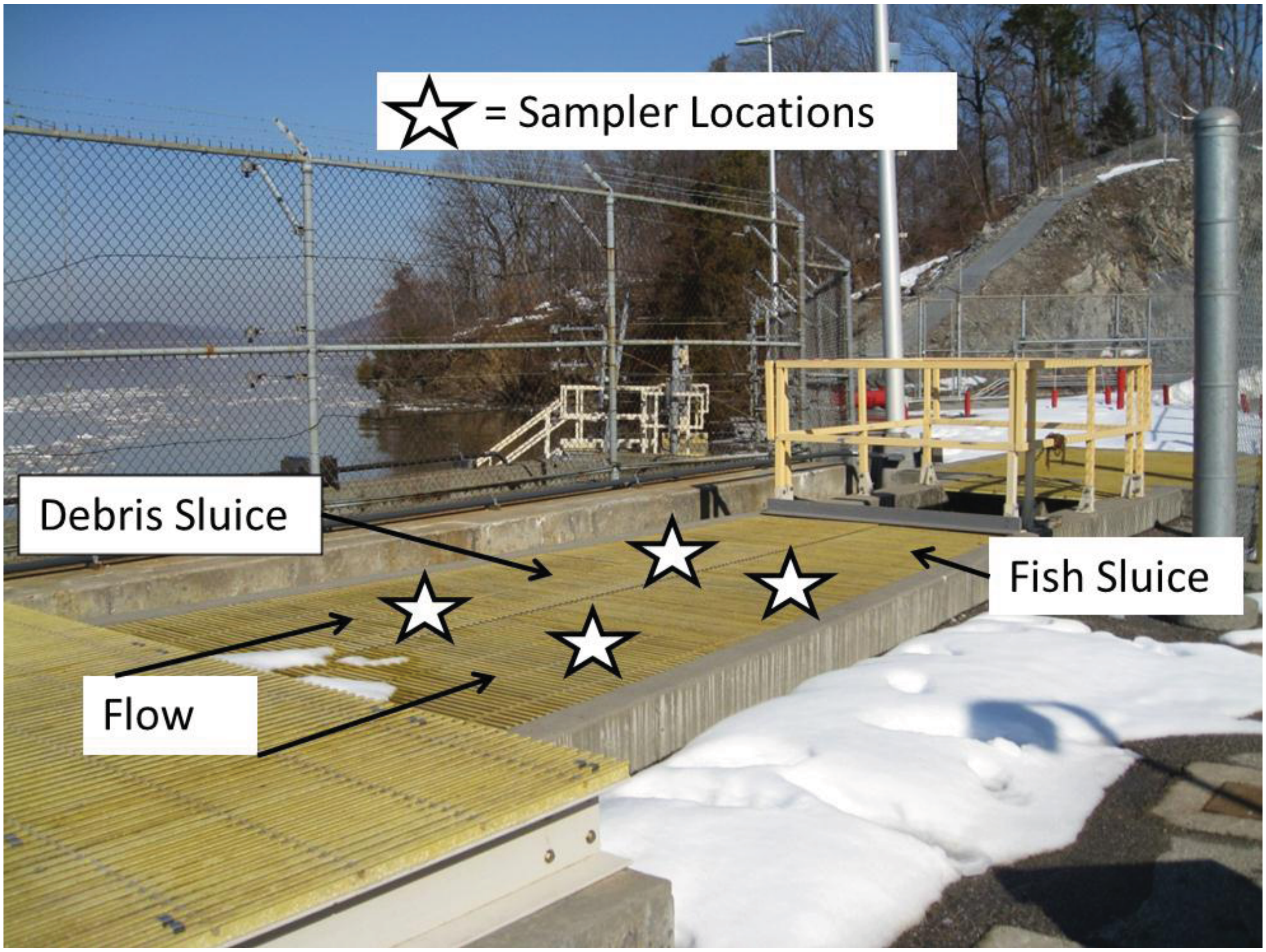


Figure 2-10. IP2 Ristroph screen fish sluice (right) and debris sluice (left) return system shown under yellow deck grating looking north from the north end of the IP2 intake bulkhead.

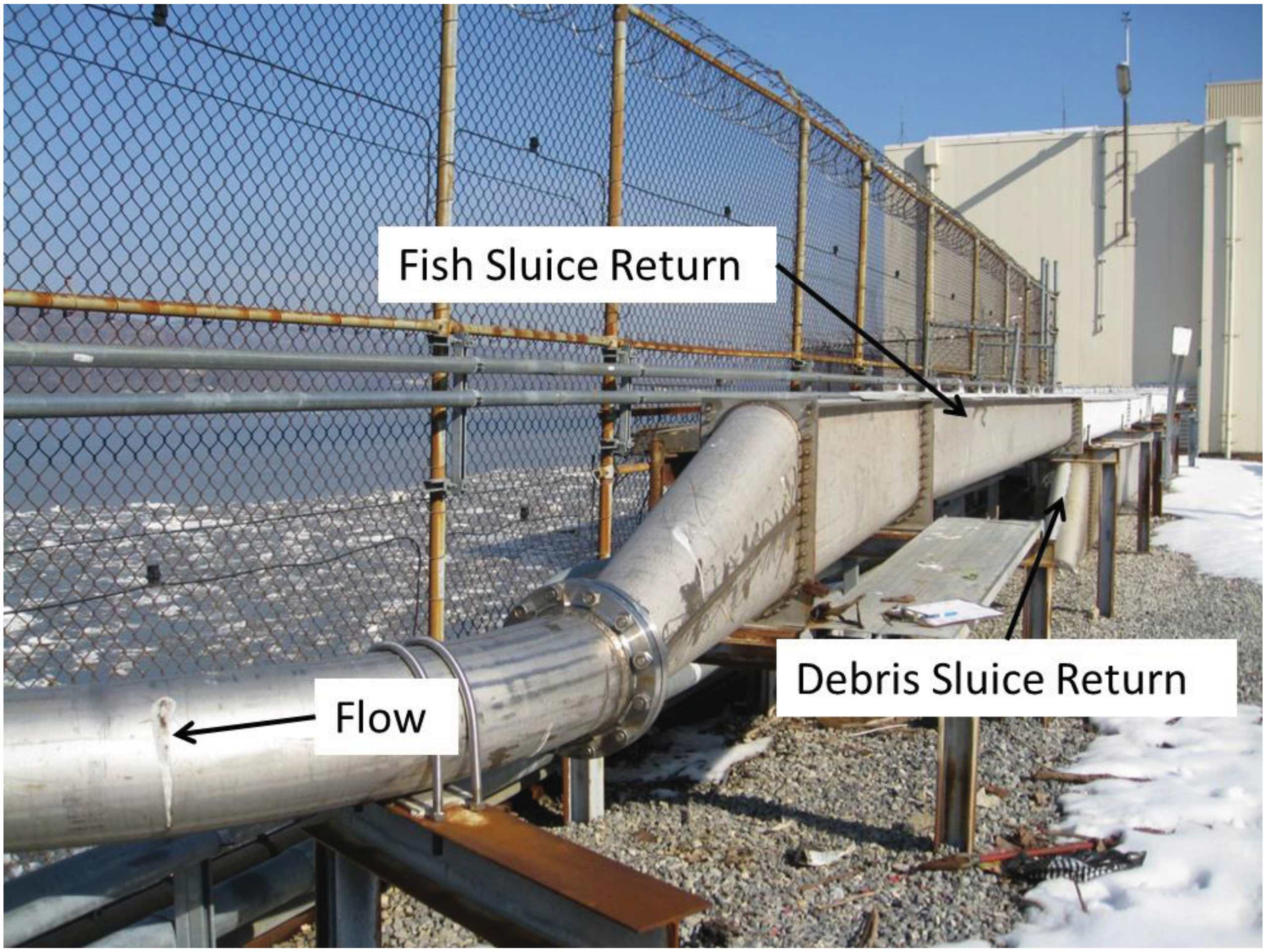


Figure 2-11. IP3 Ristroph screen fish sluice (top) and debris sluice (bottom) return system shown looking north from the south end of the IP3 intake bulkhead.

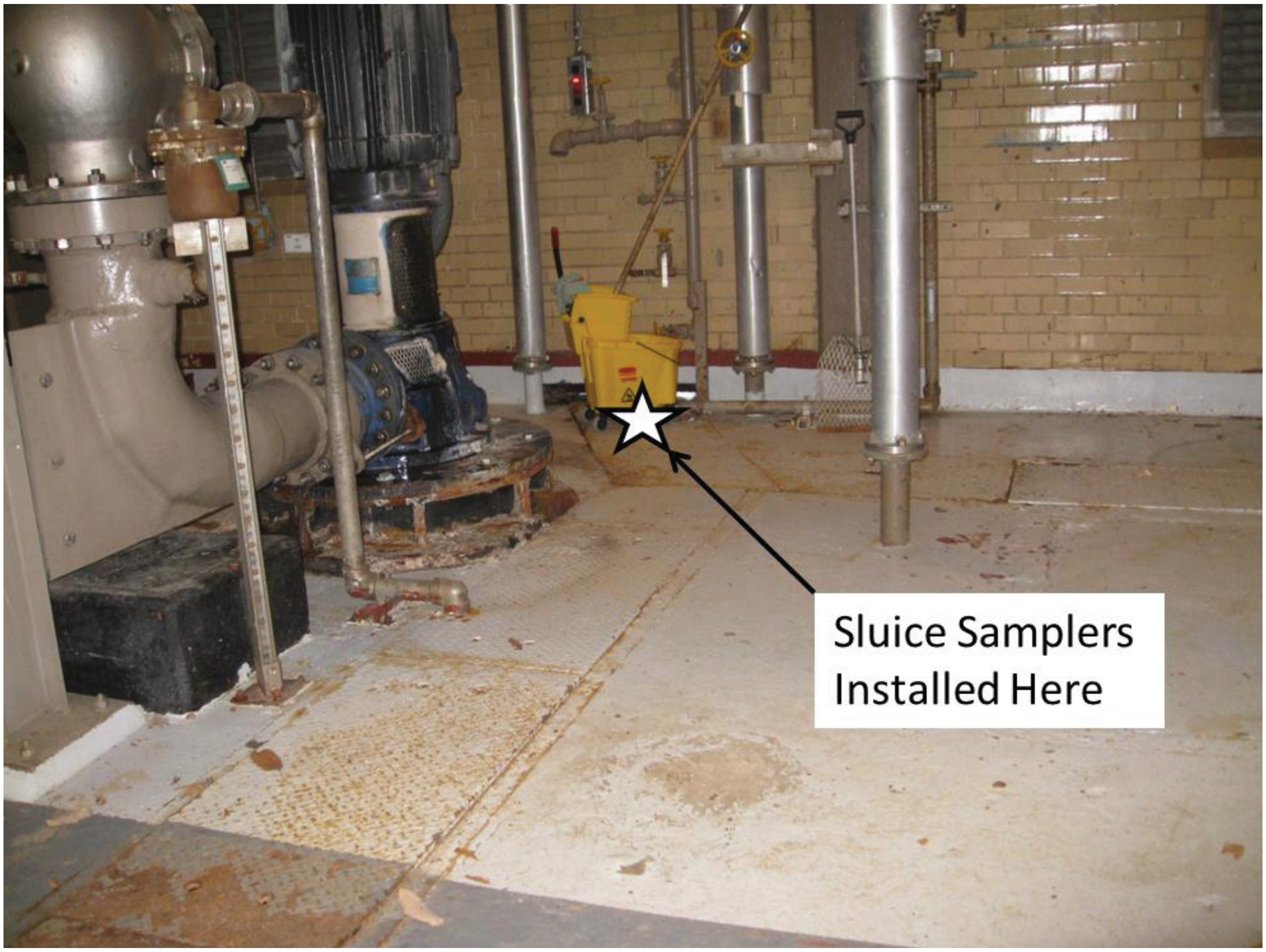


Figure 2-12. IP1 sluice system located under deck plates at the southwestern corner of the screen house where sluice sampling would occur when the plates are removed.

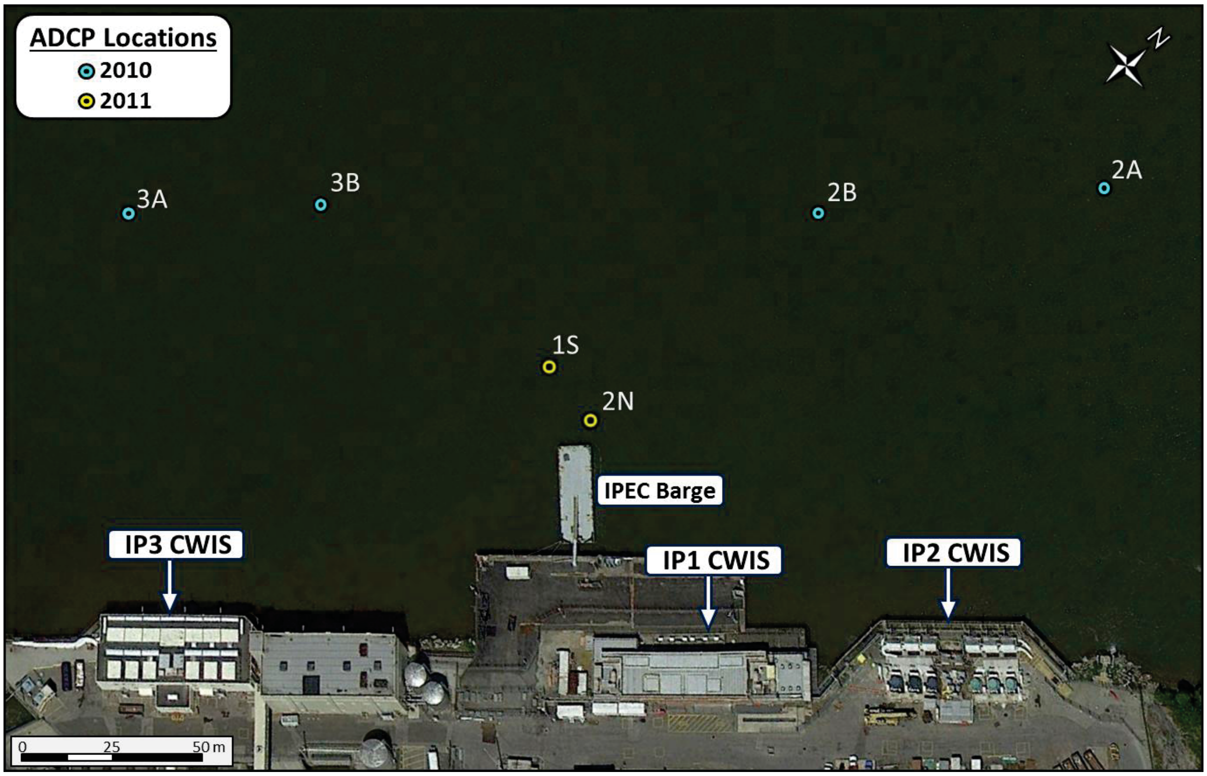


Figure 2-13. Acoustic Doppler current profiler (ADCP) monitoring station locations near IP2 and IP3 from continuous monitoring studies performed during 2010 (Stations 2A, 2B, 3A, 3B) and 2011 (Stations 1S and 2N). The base image is from Google Earth.

Incident Report Sturgeon Take – Indian Point

Photographs should be taken and the following information should be collected from all sturgeon (alive and dead) found in association with the Indian Point intakes. Please submit all necropsy results (including sex and stomach contents) to NMFS upon receipt.

Observer's full name:____
Reporter's full name:____

Species Identification :____

Site of Impingement (Unit 2 or 3, CWS or DWS, Bay #, etc.):________________________________

Date animal observed:________________ Time animal observed: ________________________
Date animal collected:________________ Time animal collected:_________________________

Environmental conditions at time of observation (i.e., tidal stage, weather):
____
____

Date and time of last inspection of intakes:_____________________________________
Water temperature (°C) at site and time of observation:_________________________
Number of pumps operating at time of observation:____________________________________
Average percent of power generating capacity achieved per unit at time of observation:________
Average percent of power generating capacity achieved per unit over the 48 hours previous to observation:____

Sturgeon Information:
Species ____________________________________

Fork length (or total length) ______________________ Weight _______________________

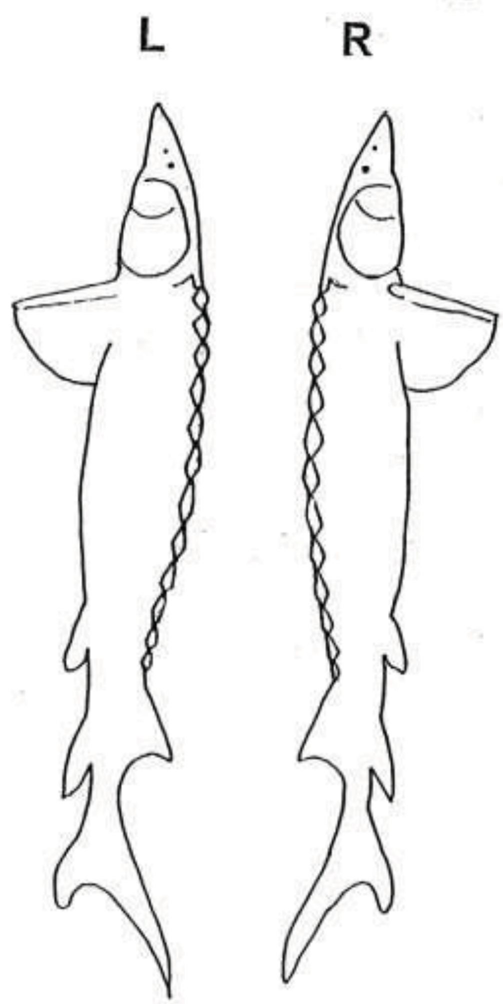
Condition of specimen/description of animal
____
____
____
____

Fish Decomposed: NO SLIGHTLY MODERATELY SEVERELY
Fish tagged: YES / NO *Please record all tag numbers.* Tag # _________________

Photograph attached: YES / NO
(please label *species, date, geographic site* and *vessel name* on back of photograph)

Figure 2-14. Incident report form for incidental take of Atlantic Sturgeon or Shortnose Sturgeon by impingement at the IPEC cooling water intakes.

Draw wounds, abnormalities, tag locations on diagram and briefly describe below



Description of fish condition:

Figure 2-14 (continued).

Appendix 4: **Summary of Environmental Sampling Data for Research Activity** [1,2]

Date	Species (ASN or SSN)	Unique ID	Location River	Location (Lat/Long or rkm)	Gear & Mesh	Net Set (min/hr)	Bottom Depth (m)	Bottom Temp (°C)	Salinity (ppt)	DO (mg/l)	Total Length (mm)	Total Weight (kg)	Mortality	Comments

1. Please coordinate with NMFS to receive a file copy of this appendix in spreadsheet format.
2. List individual fish (ASN or SNS) concurrently when recording data for multiple sturgeons in a catch

Figure 2-15. Summary form for environmental data associated with incidental take of Atlantic Sturgeon or Shortnose Sturgeon.

Instructions: Collecting, Certifying, Identifying &Shipping Tissue Samples Collected from Sturgeon.

1. **Species Certification**:
For each shipment a "*Certification of Species Identification*" (Section A) must be provided. This form documents the collector has identified the fish or fishes sampled in the shipment as either a shortnose or Atlantic sturgeon. If there is any doubt about the identity of a sample, then mark unknown and include comments on the take.

2. **Sample Identification**:
Assign a unique number identifying each individual fish captured and subsequently sampled. This number must be recorded in Section B and on the collection vial for each sample taken. Record tissue type; preservative used; date of capture; location of capture (river & description, lat/long, river km, and nearest city); length of specimen; weight; and sex, if known. Check the box provided if you are submitting multiple samples, and provide a hard-copy and/or email a copy of the sample spreadsheet with information for each of the data fields listed above.

3. **Tissue Sampling Instructions:**
a. Cleanliness of Samples: Cross contamination should be avoided. For each fish, use a clean cutting tool, syringe, etc. for collecting and handling samples.

b. Preserving & Packaging Samples:
i. Label vial with fish's unique ID number.
ii. Place a 1-2 cm^2 section of pelvic fin clip in vial with preservative (95% absolute ETOH (un-denatured), recommended).
iii. Seal individual vials or containers with leak proof positive measure (e.g., tape).
iv. Package vials and absorbent within a double sealed container (e.g., zip lock baggie).
v. Label air package properly identifying ETOH warning label (**See Appendix 3c**).

c. Shipping Instructions:
When shipping samples, place separately Appendix 3a, 3b and 3c (Sample ID and Chain of Custody Forms and Shipping Training Form) in container and seal the shipping box to maintain the chain of custody. (Note: A copy of the ESA permit authorizing the collection of the sample(s) must also accompany the sample(s)).

Important Notice: You must be certified before shipping tissue samples preserved with 95% ETOH in "excepted quantities" (A Class 3 Hazardous Material Due to Flammable Nature). See Appendix 3c: "NMFS Guidelines for Air-Shipment of Excepted Quantities of Ethanol Solutions" to comply with the DOT/IATA federal regulations.

4. **Chain of Custody Instructions:**
The "*Chain of Custody*" (Section C) should be maintained for each shipment of tissue samples and must accompany the sample(s) at all times. To maintain the chain of custody, when sample(s) are transferred, the sample(s) and the documentation should be packaged and sealed together to ensure that no tampering has occurred. All subsequent handlers breaking the seal must also sign and document the chain of custody section.

5. **Contact Information**:
A. **NMFS, Office of Protected Resources**:
i. **Primary Contact**: Malcolm Mohead (malcolm.mohead@noaa.gov) Phone: 301/713-2289
ii. **Primary Contact:** Colette Cairns (colette.cairns@noaa.gov) Phone: 301/713-2289
i. **Secondary Contact: (Northeast)** Jessica Pruden (jessica.pruden@noaa.gov) Phone: 978/281-9300
ii. **Secondary Contact: (Southeast)** Stephania Bolden (stephania.bolden@noaa.gov) Phone: 727/824-5312

B. **NOS Archive:**
i. **Primary Contact**: Julie Carter (julie.carter@noaa.gov) Phone: 843/762-8547

Figure 2-16. Instructions for collecting, certifying, identifying, and shipping sturgeon tissue samples.

Certification, Identification and Chain of Custody Form for Submitting Sturgeon Genetic Tissue Samples.[1],[2]

(A) CERTIFICATION OF SPECIES (Collector)

I, ______________________________, hereby certify that I have positively identified the
Full Name

fish or fishes sampled in this shipment as: ☐ shortnose sturgeon; ☐ Atlantic sturgeon; ☐ other ☐ unknown
based on my knowledge and experience as a ______________________________.
Position Job Title

Signature: ____________________ Date Identified: ____________________
Address: ____________________
____
Phone Number: ____________________

(B) SAMPLE IDENTIFICATION

Species Identification: ☐ shortnose sturgeon; ☐ Atlantic sturgeon; ☐ unknown
Unique ID No: __________; Tissue Type: __________; Preservative: __________;
Location: (River: __________; River-km: ______; Lat/Long: __________;
River Location Description: ____________________);
Total Length (TL) of Specimen (mm): ________ Weight of Specimen (g): ________; Sex (if known) ____

Specific comments on take: ______________________________

☐ Check here if multiple samples are submitted and use *Field Collection Report* (Appendix 3b) with the data fields listed in this section.

(C) EVIDENCE OF CHAIN OF CUSTODY

1. ____________________ ____________ ____________ ________
Release Signature | NMFS Permit No. | Method of Transfer | Date

____________________ ____________ ________
Receipt Signature | NMFS Permit No. | Date

2. ____________________ ____________ ____________ ________
Release Signature | NMFS Permit No. | Method of Transfer | Date

____________________ ____________ ________
Receipt Signature | NMFS Permit No. | Date

3. ____________________ ____________ ____________ ________
Release Signature | NMFS Permit No. | Method of Transfer | Date

____________________ ____________ ________
Receipt Signature | NMFS Permit No. | Date

[1] Instructions on next page.
[2] If multiple samples are shipped, attach summary sheet in Appendix 3b.

Figure 2-17. Certification of species, sample identification, and chain of custody form.

Appendix 3b

Summary Sheet for Genetic Tissue Samples [1,2]

Date	Species	Unique ID.	Genetic Tissue Type	Preservative	Location: (River)	Location (River km)	Location (Lat/Long)	Total Length (mm)	Weight (g)	Sex	Comments

1. Please coordinate with NMFS to receive a file copy of this appendix in spreadsheet format.
2. If multiple samples are shipped, attach this form (and disk copy) to supplement Appendix 3a.

Figure 2-18. Summary form for sturgeon genetic tissue samples.

Appendix 3c

NMFS Guidelines for Air-Shipment of "Excepted Quantities" of Ethanol Solutions

These guidelines have been adapted with permission from the University of New Hampshire-Office of Environmental Health & Safety; our appreciation is to Andy Glode for providing reference materials upon which this guide was created.

The U.S. Department of Transportation (DOT: 49 CFR 173.4) and the International Air Transport Association (IATA: 2007 Dangerous Goods Regulations, Sec. 2.7) regulate shipments of ethanol (ETOH) in *excepted quantities*. As a result, specific procedures must be followed as well as certifying proper training of individuals prior to packaging and shipping specimens preserved in ETOH. These guidelines will inform proper shipping and also satisfy certifying requirements. Failure to meet such requirements could result in regulatory fines and/or imprisonment.

Therefore, prior to submitting ETOH preserved samples and appropriate documentation (*e.g.*, a FedEx Airbill) to a carrier, please read, initial and sign this document, affirming you have understood the requirements as outlined. Please include this document in the shipping package and retain a copy for your records.

1) Packages and documents submitted to a carrier must not contain any materials other than those described in this document (*i.e.* containers holding ethanol-preserved specimens and related absorbent and packaging materials). Also, laboratory or sampling equipment, *unrelated documents*, or other goods must be packaged and shipped in separate boxes. (Note: ETOH solutions are not permitted to be transported in checked baggage, carry-on baggage, or airmail.) **I understand (______)**

2) Please read the manufacturer's Material Safety Data Sheet (MSDS) for ETOH recognizing ETOH (55 - 100%) is classed as hazardous flammable material (NFPA Rating = 3). Note also, its vapor is capable of traveling a considerable distance to an ignition source causing "flashback." Properly packaging and labeling shipments of ethanol solutions will minimize the chance of leakage, and would also communicate the potential hazard to transport workers in the event of a leak. **I understand (______)**

a) Quantity Limits: Small quantities (inner container less than 30 ml, with a maximum net quantity of 500 ml for the entire package) of ETOH can be shipped with "Excepted Quantities" labels without completion of a Dangerous Goods Declaration. (e.g., If shipping vials having a maximum volume of 10 ml each, you may put up to 50 vials in one box.) **I understand (______)**

b) Package Components:

i. ***Inner (primary) packaging (e.g., vial, tube, jar, etc.)***: Do not completely fill inner packaging; allow 10% head-space for liquid expansion. Liquids must not completely fill inner packaging at a temperature of 55°C (130°F). Closures of inner packaging (e.g., vials with tops) must be held securely in place with tape or other positive means. **I understand (______)**

ii. ***Intermediate (secondary) packaging (e.g. Ziplock or other plastic bag)***: Place inner container(s) (*e.g.*, vials with ETOH) into a high-quality plastic bag. Then add an absorbent material capable of absorbing any spillage without reacting with the ethanol. Seal the first bag tightly and then tape the locking seals. Next, seal the inner bag within a second bag for added safety. **I understand (______)**

iii. ***Outer packaging (e.g., cardboard box)***: Ethanol solutions may not be shipped in envelopes, Tyvek® sleaves, or other non-rigid mailers. The dimensions of the outer box must be at least 100 mm (~4 inches) on two sides. Any space between the inner packing containers placed in the outer packaging should be eliminated with additional filler. **I understand (______)**

c) Package Labels:

i. ***Dangerous Goods in Excepted Quantities Label* (Figure 1.)**: The label must display a "3" as the ethanol hazard class number using a black marker. You may obtain self-adhesive labels from NMFS, or else, order online. **I understand (______)**

ii. ***Name and Address:*** The outer container must display the name and address of the shipper and consignee. When re-using shipping boxes, completely remove or black out all unnecessary labels or marks. **I understand (______)**

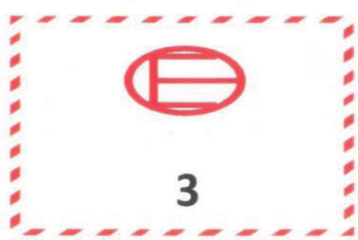


Figure 1. Dangerous Goods in Excepted Quantities label

Figure 2-19. Guidelines and form for air shipment of "excepted quantities" of ethanol solutions.

Appendix 3c (continued)

d) **Package Tests:**
A representative example of packaging used for excepted quantities of ethanol solutions must pass a drop test and compressive load test without any breakage or leakage of any inner packaging and without any significant reduction in package effectiveness. Perform the following tests on a representative example of your packaging and keep a record of the results.

i. ***Drop Test*:** Drop a representative package from a height of 1.8 m (5.9 feet) directly onto a solid unyielding surface:

		Test Results
a.	One drop flat on the base;	(______________________)
b.	One drop flat on top;	(______________________)
c.	One drop flat on the longest side;	(______________________)
d.	One drop flat on the shortest side; and	(______________________)
e.	One drop on a corner.	(______________________)

ii. ***Compressive Load Test*:** Apply a force to the top surface of a representative package for a duration of 24 hours, equivalent to the total weight of identical packages if stacked to a height of 3 meters. (______________________)

e) **Package Documentation:**
Proper documentation is required for all shipments of hazardous materials. Incorrect documentation is the most common cause for package refusal. If using documentation for couriers other than FedEx, UPS and DHL, please contact NMFS for assistance.

i. ***FedEx*:** For domestic shipments with FedEx Express, fill out the standard US Airbill. Fill out the form completely including the following information:

a. In Section 6, Special Handling, check the box "Yes, Shipper's Declaration not required."
b. On the top of the form above the FedEx tracking number, include the statement, "***Dangerous Goods in Excepted Quantities***" See example in **Figure 2.** **I understand (______)**

ii. ***DHL*:** The "*Nature and Quantity of Goods*" box of the air waybill must include "**Dangerous Goods in Excepted Quantities.**"
I understand (______)

Figure 2. Example of FedEx Airbill

Include this statement and check this box.

By signing this document, I affirm I understand the hazards associated with ethanol and the shipping requirements for ethanol solutions, as outlined in this guide. I also understand I am required to include a copy of this document in the package and that it should be appended to an ESA permit (if listed samples are shipped).

Print Name:		Signature:	
Employer:		Employer Address:	
Date:			Phone:

Figure 2-19 (continued).

Appendix 5: **Sturgeon Salvage Form**

For use in documenting dead sturgeon in the wild under ESA Permit No. 1614 (version 07-20-2009)

INVESTIGATORS'S CONTACT INFORMATION

Name: First ______________ Last ____________________

Agency Affiliation ______________ Email____________________

Address ____

____

Area code/Phone number ____

UNIQUE IDENTIFIER (Assigned by NMFS)

DATE REPORTED:
Month ☐☐ Day☐☐ Year 20☐☐

DATE EXAMINED:
Month ☐☐ Day☐☐ Year 20☐☐

SPECIES: (check one)
- ☐ shortnose sturgeon
- ☐ Atlantic sturgeon
- ☐ Unidentified *Acipenser* species

Check "Unidentified" if uncertain.
See reverse side of this form.

LOCATION FOUND: ☐Offshore (Atlantic or Gulf beach) ☐Inshore (bay, river, sound, inlet, etc)

River/Body of Water______________ City____________________ State ____

Descriptive location (be specific)____________________________________

____

____

Latitude ____________N (Dec. Degrees) Longitude ____________ W (Dec. Degrees)

CARCASS CONDITION at time examined: (check one)
- ☐ 1 = Fresh dead
- ☐ 2 = Moderately decomposed
- ☐ 3 = Severely decomposed
- ☐ 4 = Dried carcass
- ☐ 5 = Skeletal, scutes/ cartilage

SEX:
- ☐ Undetermined
- ☐ Female ☐ Male

How was sex determined?
- ☐ Necropsy
- ☐ Eggs/milt present when pressed
- ☐ Borescope

MEASUREMENTS: **Circle unit**

Fork length ________ cm / in

Total length ________ cm / in

Length ☐ actual ☐ estimate

Mouth width (inside lips, see reverse side) ________ cm / in

Interorbital width (see reverse side) ________ cm / in

Weight ☐ actual ☐ estimate ________ kg / lb

TAGS PRESENT? Examined for external tags including fin clips? ☐ Yes ☐ No Scanned for PIT tags? ☐ Yes ☐ No

Tag #	Tag Type	Location of tag on carcass
____________________	________________________	____________________________
____________________	________________________	____________________________

CARCASS DISPOSITION: (check one or more)
- ☐1 = Left where found
- ☐2 = Buried
- ☐3 = Collected for necropsy/salvage
- ☐4 = Frozen for later examination
- ☐5 = Other (describe)

____

Carcass Necropsied?
☐Yes ☐No

Date Necropsied:__________

Necropsy Lead:

____

PHOTODOCUMENTATION:

Photos/vide taken? ☐ Yes ☐ No

Disposition of Photos/Video:__________

____

____

SAMPLES COLLECTED? ☐ Yes ☐ No

Sample	How preserved	Disposition (person, affiliation, use)
__________________	______________________	________________________________
__________________	______________________	________________________________
__________________	______________________	________________________________
__________________	______________________	________________________________
__________________	______________________	________________________________
__________________	______________________	________________________________
__________________	______________________	________________________________
__________________	______________________	________________________________

Comments:

____

____

____

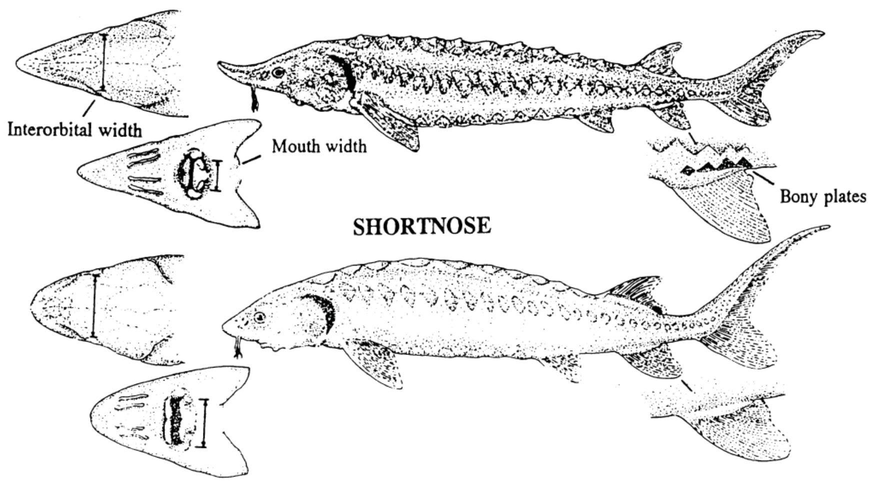
____

Figure 2-20. Sturgeon salvage form.

Distinguishing Characteristics of Atlantic and Shortnose Sturgeon (version 07-20-2009)

Characteristic	Atlantic Sturgeon, *Acipenser oxyrinchus*	Shortnose Sturgeon, *Acipenser brevirostrum*
Maximum length	> 9 feet/ 274 cm	4 feet/ 122 cm
Mouth	Football shaped and small. Width inside lips < 55% of bony interorbital width	Wide and oval in shape. Width inside lips > 62% of bony interorbital width
*Pre-anal plates	Paired plates posterior to the rectum & anterior to the anal fin.	1-3 pre-anal plates almost always occurring as median structures (occurring singly)
Plates along the anal fin	Rhombic, bony plates found along the lateral base of the anal fin (see diagram below)	No plates along the base of anal fin
Habitat/Range	Anadromous; spawn in freshwater but primarily lead a marine existence	Freshwater amphidromous; found primarily in fresh water but does make some coastal migrations

* From Vecsei and Peterson, 2004



Describe any wounds / abnormalities (note tar or oil, gear or debris entanglement, propeller damage, etc.). **Please note if no wounds / abnormalities are found.**

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Data Access Policy: Upon written request, information submitted to National Marine Fisheries Service (NOAA Fisheries) on this form will be released to the requestor provided that the requestor credit the collector of the information and NOAA Fisheries. NOAA Fisheries will notify the collector that these data have been requested and the intent of their use.

Submit completed forms (within 30 days of date of investigation) to: Jessica Pruden, Shortnose Sturgeon Recovery Coordinator, NOAA Fisheries Northeast Region, 55 Great Republic Drive, Gloucester, MA 01930. Phone: 978-282-8482; Fax: 978-281-9394; E-Mail Jessica.Pruden@noaa.gov

Figure 2-20 (continued)

NORMANDEAU ASSOCIATES
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3 December 2013

Mr. John K. Bullard, Regional Administrator
National Marine Fisheries Service
55 Great Republic Drive
Gloucester, MA 01930-2276

Re: **Proposed Monitoring Plan for Indian Point Energy Center Take of Atlantic and Shortnose Sturgeons by Impingement at Cooling Water Intakes Revision 1**

Dear Mr. Bullard:

Please find enclosed one copy of the revised (Revision 1) Monitoring Plan that was prepared on behalf of Entergy Nuclear Operations, Inc. ("Entergy") Indian Point Energy Center ("IPEC") by Normandeau Associates, Inc. ("Normandeau") and ASA Analysis and Communications, Inc. ("ASA") to address Reasonable and Prudent Measure ("RPM") #1 as specified in Terms and Conditions ("T&C") #1 of the Final Biological Opinion for Continued Operation of Indian Point Nuclear Generating Unit Nos. 2 and 3 dated 30 January 2013, and your subsequent comments in a letter to Ms. Dara Gray of IPEC dated 23 October 2013.

A copy of this letter and the Revision 1 Monitoring Plan were also sent by email to the members of your staff and others identified in the enclosed distribution list. We look forward to answering any remaining questions that you or your staff may have and to implementing the Revision 1 Monitoring Plan as proposed. Please contact Ms. Dara Gray of IPEC at the address shown below if you have further questions.

Sincerely,

NORMANDEAU ASSOCIATES, INC.

Mark T. Mattson

Mark T. Mattson, Ph.D.
Vice President

Email Distribution List 3 December 2013 (those with mailing addresses will also receive printed copy):

"Proposed Monitoring Plan for Indian Point Energy Center Take of Atlantic and Shortnose Sturgeons by Impingement at Cooling Water Intakes Revision 1" 3 December 2013.

Ms. Mary A. Colligan
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Email Distribution List 3 December 2013 (continued)

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