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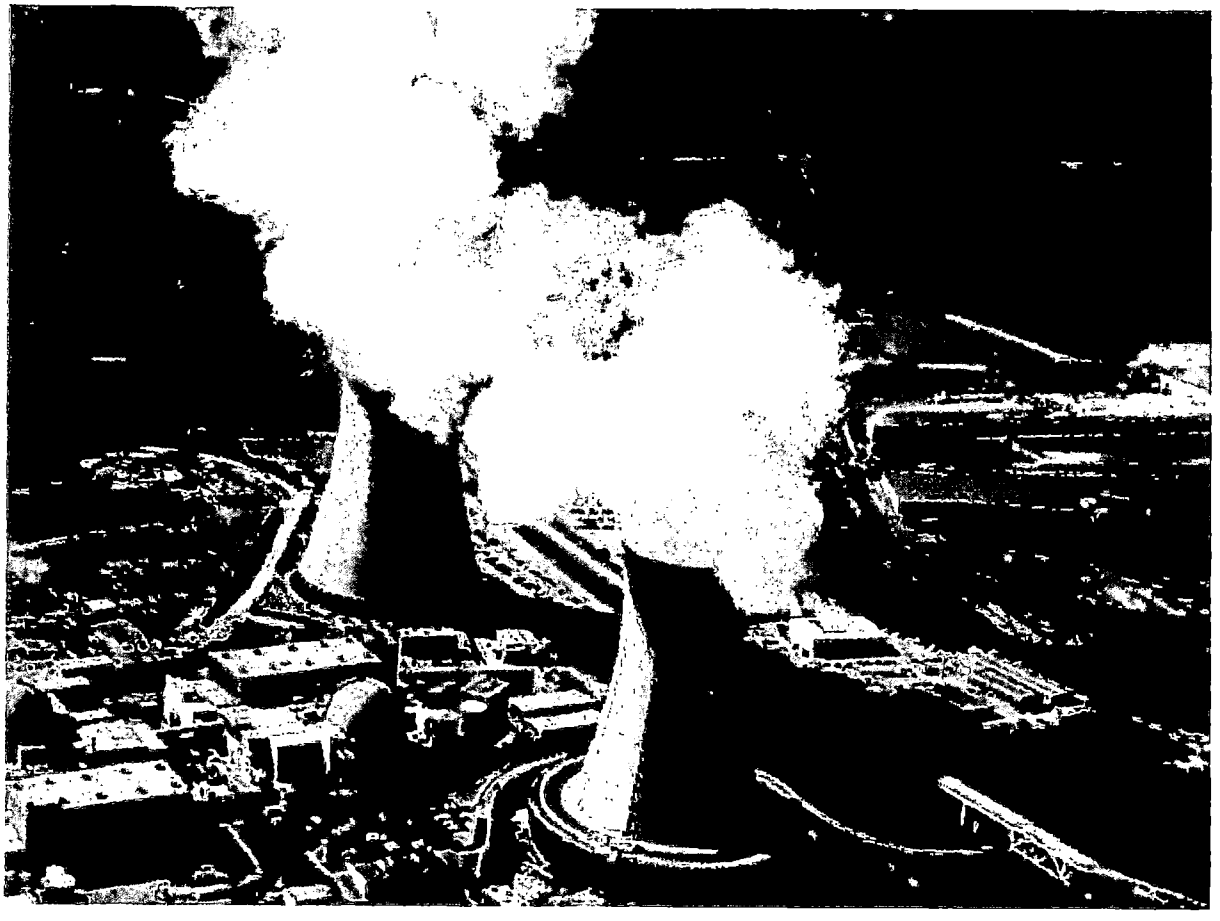
ENERGY HARBOR NUCLEAR CORPORATION

BEAVER VALLEY POWER STATION



2019

ANNUAL ENVIRONMENTAL OPERATING REPORT

NON-RADIOLOGICAL

UNITS NO. 1 AND 2

LICENSES DPR-66 AND NPF-73

5.1.1 BEAVER VALLEY POWER STATION

ENVIRONMENTAL & CHEMISTRY SECTION

Technical Report Approval

2019 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

(Non-Radiological)

UNITS NO. 1 AND 2

LICENSES DPR-66 AND NPF-73

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1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This report is submitted in accordance with Section 5.4.1 of **Appendix B: To Facility Operating License No. NPF-73, Beaver Valley Power Station Unit 2, Environmental Protection Plan (Non-Radiological).** Beaver Valley Power Station (BVPS) is operated by Energy Harbor (EH), formerly FirstEnergy Nuclear Operating Company (FENOC). The Objectives of the Environmental Protection Plan (EPP) are to:

- Verify that the facility is operated in an environmentally acceptable manner, as established by the Final Environmental Statement-Operating License Stage (FES-OL) and other Nuclear Regulatory Commission (NRC) environmental impact assessments,
- Keep plant operations personnel appraised of changes in environmental conditions that may affect the facility,
- Coordinate NRC requirements and maintain consistency with other Federal, State, and local requirements for environmental protection, and
- Keep the NRC informed of the environmental effects of facility construction and operation and of actions taken to control those effects.

To achieve the objectives of the EPP, both EH and BVPS have written programs and procedures to comply with the EPP, protect the environment, and comply with governmental requirements primarily including the US Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Protection (PADEP) requirements. Water quality matters identified in the Final Environmental Statements-Operating License Stage (FES-OL) are regulated under the National Pollutants Discharge Elimination System (NPDES) Permit No. PA0025615. Waste is regulated under EPA Identification No. PAR000040485. Attachment 10.1 contains a listing of permits and certificates for environmental compliance.

The BVPS programs and procedures include pre-work and pre-project environmental evaluations, operating procedures, pollution prevention and response programs procedures and plans, process improvement and corrective action programs, and human performance programs. Technical and managerial monitoring of tasks, operations, and other activities are performed. Any identified challenges, concerns, or questions are captured in the EH Corrective Action Program with a Condition Report. Condition Reports are reviewed and closed through investigations, cause determinations, and corrective actions.

During 2019 BVPS continued an Aquatic Monitoring Program to provide information on potential impacts to BVPS operation from macrofoulers such as Asian clams and zebra mussels.

1.2 SUMMARY & CONCLUSIONS

There were no significant environmental events and no significant changes to operations which affect the environment made at Beaver Valley Power Station in 2019.

1.3 ANALYSIS OF SIGNIFICANT ENVIRONMENTAL CHANGE

During 2019 no significant changes were made at BVPS to cause any significant negative impacts on the environment.

1.4 AQUATIC MONITORING PROGRAM EXECUTIVE SUMMARY

The 2019 Beaver Valley Power Station (BVPS) Units 1 and 2 Non-Radiological Monitoring Program consisted of an Aquatic Program that included surveillance and field sampling of the Ohio River's aquatic life in the vicinity of the station. Historically, the Aquatic Program was an annual program conducted to provide baseline aquatic resources data, to assess the impact of the operation of BVPS on the aquatic ecosystem of the Ohio River, and to monitor for potential impacts of biofouling organisms (*Corbicula* and zebra mussels) on BVPS operations. This is the 44th year of operational environmental monitoring for Unit 1 and the 33rd year for Unit 2. In 2019, similar to 2017 and 2018, no fish or benthic macroinvertebrate sampling occurred, however, the zebra mussel and *Corbicula* monitoring programs were continued.

The monthly reservoir ponar samples collected at the Unit 1 and 2 cooling towers and the three samples collected at the intake during 2019 indicated that *Corbicula* were present in the Ohio River and entering the station. In 2019, seven (7) live and seven (7) dead settled *Corbicula* were collected from the Unit 1 cooling tower reservoir during monthly ponar sampling. Also, in 2019, 36 live and 15 dead settled *Corbicula* were collected from the Unit 2 cooling tower reservoir. Juvenile *Corbicula* were also collected in pump samples at all locations sampled in 2019. ***The overall low numbers of live* Corbicula *collected in the samples collected outside the intake and cooling towers in 2019 compared to levels in the 1980's, likely reflects a natural decrease in the density of* Corbicula *in the Ohio River near BVPS, although the continued presence of* Corbicula *adults and juveniles in and near BVPS indicates that they could impact the facility if the current control program is not continued. Continued monitoring of* Corbicula *densities is also recommended to determine whether changes in the* Corbicula *populations that could impact facility operations are occurring.***

In 1995, live macrofouling zebra mussels were collected for the first time by divers in the BVPS main intake and auxiliary intake structures during scheduled cleanings. Zebra Mussels have been found at BVPS every year since. Overall, both the number of observations and densities of settled mussels in 2019 were consistent to those recorded in 2008-2018, and much higher than the preceding five years. Although densities of settled mussels are lower than other populations such as the Lower Great Lakes, densities comparable to those in the Ohio River are more than sufficient to cause problems in the operation of untreated cooling water intake systems. ***Whether the population of zebra mussels in this reach of the Ohio River will remain the same or increase cannot be determined. In any case, the densities of mussels that presently exist are more than sufficient to impact the BVPS if continued prudent monitoring and control activities are not conducted.***

2.0 ENVIRONMENTAL PROTECTION PLAN NON-COMPLIANCES

There were no Environmental Protection Plan non-compliances identified in 2019.

3.0 CHANGES INVOLVING UNREVIEWED ENVIRONMENTAL QUESTIONS

No Unreviewed Environmental Questions were identified in 2019. Therefore, there were no changes involving an Unreviewed Environmental Questions.

4.0 NONROUTINE ENVIRONMENTAL REPORTS

There were no nonroutine environmental reports in 2019.

5.0 AQUATIC MONITORING PROGRAM

This section of the report summarizes the Non-Radiological Environmental Program conducted for the BVPS Units 1 and 2; Operating License Numbers DPR-66 and NPF-73. This is a non-mandatory program, because on February 26, 1980, the NRC granted BVPS's request to delete all of the Aquatic Monitoring Program, with the exception of the fish impingement program (Amendment No. 25), from the Environmental Technical Specifications (ETS). In 1983, BVPS was permitted to also delete the fish impingement studies from the ETS program of required sampling along with non-radiological water quality requirements. In 2017, BVPS elected to not conduct the fish and benthic macroinvertebrate tasks related to this program. The zebra mussel and Corbicula monitoring tasks were maintained and conducted as in previous years.

The objectives of the 2019 environmental program were:

- To evaluate the presence, growth, and reproduction of macrofouling Corbicula (Asiatic clam) and zebra mussels (Dreissena spp.) at BVPS.
- Keep plant operations appraised of any of changes in environmental conditions that may affect the facility.

These objectives have assisted facility personnel in the past. For instance, in the facility's Significant Operating Experience Report (SOER 07-2, October 2008) relative to "Intake Cooling Water Blockage" this Aquatic Monitoring Program was credited as a means of addressing "Changing Environmental Conditions" by looking "for changes in quantity of clam and mussel activity by monitoring the veliger (commonly known as larvae) density in the river and mussel settlement density."

5.1 SITE DESCRIPTION

BVPS is located on an approximately 453-acre tract of land on the south bank of the Ohio River in the Borough of Shippingport, Beaver County, Pennsylvania. The Shippingport Atomic Power Station once shared the site with BVPS, before being decommissioned. Figure 5.1 is a plan view of BVPS. The site is approximately 1 mile (1.6 km) from Midland, Pennsylvania; 5 miles (8 km) from East Liverpool, Ohio; and 25 miles (40 km) from Pittsburgh, Pennsylvania. The population within a 5-mile (8 km) radius of the plant is approximately 18,000. The Borough of Midland, Pennsylvania has a population of approximately 3,500.

The station is situated at Ohio River Mile 34.8 (Latitude: 40° 36' 18"; Longitude: 80° 26' 02") at a location on the New Cumberland Pool that is 3.1 river miles (5.3 km) downstream from Montgomery Lock and Dam and 19.6 miles (31.2 km) upstream from New Cumberland Lock and Dam. The Pennsylvania-Ohio-West Virginia border is 5.2 river miles (8.4 km) downstream from the site. The river flow is regulated by a series of dams and reservoirs on the Beaver, Allegheny, Monongahela, and Ohio Rivers and their tributaries.

The study site lies along the Ohio River in a valley that has a gradual slope that extends from the river at an elevation of 665 ft. (203 m) above mean sea level; to an elevation of 1,160 ft. (354 m) along a ridge south of BVPS. The plant entrance elevation at the station is approximately 735 ft. (224 m) above mean sea level.

BVPS Units 1 and 2 have a thermal rating of 2,900 megawatts (MW). Units 1 & 2 have a design electrical rating of 974 MW and 1,009 MW, respectively. The circulating water systems for each unit are considered a closed cycle system with continuous overflow, using a cooling tower to minimize heat released to the Ohio River. Commercial operation of BVPS Unit 1 began in 1976 and Unit 2 began operation in 1987.

5.2 METHODS

Civil & Environmental Consultants, Incorporated (CEC Inc.) was contracted to perform the 2019 Aquatic Monitoring Program as specified in BVBP-ENV-001-Aquatic Monitoring (procedural guide). This procedural guide references and describes in detail the field and laboratory procedures used in the various monitoring programs, as well as the data analysis and reporting requirements. These procedures are summarized according to task in the following subsections. Sampling was conducted according to the schedule presented in Table 5.1.

5.2.1 *Corbicula* Density Determinations for Cooling Tower Reservoirs

The Corbicula Monitoring Program at BVPS includes sampling the circulating river water and the service water systems of the BVPS (intake structure and cooling towers). The objectives of the ongoing Monitoring Program were to evaluate the presence of Corbicula at BVPS and to evaluate the potential for and timing of infestation of the BVPS. This program was conducted in conjunction with a program to monitor for the presence of macrofouling zebra mussels (see Section 5.2.3).

Corbicula enter the BVPS from the Ohio River by passing through the water intakes, and eventually settle in low flow areas including the lower reservoirs of the Units 1 and 2 cooling towers. Corbicula residing in the cooling water system can also produce young that will settle in the system. The density and growth of these Corbicula were monitored by collecting monthly samples from the lower reservoir sidewalls and sediments. The sampler used on the sidewalls consisted of a D-frame net attached behind a 24-inch long metal scraping edge. This device was connected to a pole long enough to allow the sampler to extend down into the reservoir area from the outside wall of the cooling tower. Sediments were sampled with a petite Ponar dredge. All equipment was tied off prior to sampling to prevent equipment from accidently falling into the reservoirs.

Cooling tower reservoir sampling was historically conducted once per month. Beginning in December 1997, it was decided to forego sampling in cold water months since buildup and growth of Corbicula does not occur then. Monthly sampling has been maintained throughout the warmer water

months of the year. In 2019 sampling was scheduled to begin in April and to end in October. Access complications impeded sampling in April 2019. Sampling was successfully completed in all other scheduled months.

In 2019, once each month (May through October), a single petite Ponar grab sample was taken in the reservoir of each cooling tower to obtain density and growth information on Corbicula present in the bottom sediment. The samples collected from each cooling tower were returned to the laboratory and processed. Samples were individually washed, and any Corbicula removed and rinsed through a series of stacked U.S. Standard sieves that ranged in mesh size from 1.00 mm to 9.49 mm. Live and dead clams retained in each sieve were counted and the numbers were recorded. The size distribution data obtained using the sieves reflected clam width, rather than length. Samples containing a small number of Corbicula were not sieved; individuals were measured and placed in their respective size categories. A scraping sample of about 12 square feet was also collected at each cooling tower during each monthly sampling effort. This sample was processed in a manner consistent with the petite ponar samples. All samples were successfully collected.

5.2.2 *Corbicula* Juvenile Monitoring

The Corbicula juvenile study was designed to collect data on Corbicula spawning activities and growth of individuals entering the intake from the Ohio River. From 1988 through 1998, clam cages were deployed in the intake forebay to monitor for Corbicula that entered the BVPS.

During the 1998 sampling season, at the request of BVPS personnel, all clam cages were removed after the May collection. Monthly petite ponar grabs from the forebay in the intake building continued thereafter. Samples were processed in the same manner as Cooling Tower samples (Section 5.2.1).

From 2002 to present, because of site access restrictions, sampling with the petite ponar has been moved to the Ohio River directly in front of the Intake Structure Building. Collections are presently scheduled to be made in May, July, and September. During each sampling month two ponar grabs are taken just offshore of the intake building. These grab samples are processed in the same manner as when they were collected during monthly sampling.

5.2.3 Zebra Mussel Monitoring

The Zebra Mussel Monitoring Program includes sampling the Ohio River and the circulating river water system of the BVPS.

The objectives of the Monitoring Program are:

(1) To identify if zebra mussels were in the Ohio River adjacent to BVPS and provide early warning to operations personnel as to their possible infestation;

(2) To provide data as to when the larvae were mobile in the Ohio River and insights as to their vulnerability to potential treatments; and

(3) To provide data on their overall density and growth rates under different water temperatures and provide estimates on the time it requires these mussels to reach the size and density that could impact the plant.

The zebra mussel sampling for settled adults was historically conducted once per month throughout the year. Beginning in December 1997, it was decided to forego sampling in the colder water months of each year, since buildup of zebra mussels and growth of the individuals that were present, does not occur. Monthly sampling has been maintained throughout the balance of the year. In 2019 sampling occurred from May through October.

A pump sample for zebra mussel veligers was collected at the barge slip location monthly from April through October in 1996 and 1997. The scope of the sampling was expanded in 1998 to also include the intake structure. In June 1998, the Emergency Outfall Facility (EOF) and Emergency Outfall Impact Basin (splash pool) locations were also added. Additional pump samples were collected from the cooling towers of Unit 1 and Unit 2 in October 1998. In 2019, veliger sampling began in May and was scheduled to be conducted monthly through October.

At the Intake Structure and Barge Slip the following surveillance techniques were used:

- Wall scraper sample collections on a monthly basis from the barge slip and the riprap near the intake structure to detect attached adults; and
- Pump sample collections from the barge slip and outside the intake structure, to detect the planktonic early life forms.

At each of the cooling towers the following techniques were used:

- Monthly reservoir scraper sample collections in each cooling tower; and
- Monthly pump samples to detect planktonic life forms.

At the EOF and the splash pool the following techniques were used:

- Monthly scraper sample collections in each; and
- Monthly pump samples in each to detect planktonic life forms.

5.2.4 Reports

Each month when sampling was performed, activity reports summarizing the activities that took place the previous month were prepared and submitted. These reports included the results of the monthly *Corbicula* and zebra mussel monitoring including any trends observed and any preliminary results available. The reports addressed progress made on each task and reported any observed biological activity of interest.

5.3 AQUATIC MONITORING PROGRAM AND RESULTS

The following sections summarize the findings for each of the program elements. Sampling dates for each of the program elements are presented in Table 5.1.

5.3.1 *Corbicula* Monitoring Program

In 2019, no sampling was conducted at the Unit 1 cooling tower reservoir in October due to a scheduled outage, and access issues impeded all April sampling. All other sampling was successfully conducted as scheduled.

In 2019, seven (7) settled live Corbicula were collected from the Unit 1 cooling tower reservoir during monthly ponar sampling (Table 5.2 and Figure 5.2). One was collected in May and was in the 3.4 mm to 4.7 mm size class, which indicated that it had settled late in 2018. Three settled live Corbicula were collected in August and were between 4.75 mm and 6.30 mm, which indicated that it had settled earlier in 2019. Three additional live Corbicula (between 4.75 mm and 9.94 mm) were collected in September and also likely settled earlier in 2019. Seven dead Corbicula were also collected in 2019 in the Unit 1 cooling tower reservoir. The seasonal average density of settled live Corbicula was 60/m2, which was higher than in 2018 (36/m2). Corbicula juveniles were also collected in monthly pump samples collected in the Unit 1 cooling tower reservoir in August. No Corbicula were collected in the scraping samples.

In 2019, 36 live settled Corbicula were collected from the Unit 2 cooling tower reservoir (Table 5.3 and Figure 5.3). Live mussels were collected in all months sampled. They ranged in size from 3.35 mm to greater than 9.5 mm, which indicated that some of them settled prior to 2019. Fifteen (15) dead Corbicula were also collected during 2019. The dead Corbicula were collected in all sampled months except June and were probably killed by scheduled molluscicide treatments. The seasonal average density of settled live Corbicula was 258/m2 that was comparable to 2018 but higher than 2017 and 2016. The highest density of settled live Corbicula occurred in the May sample when a density of 688 Corbicula/m2 was present. Corbicula juveniles were only collected in monthly pump samples collected in the Unit 2 cooling tower reservoir in August. No Corbicula were collected in the scraping samples.

Corbicula juveniles were collected at non cooling tower locations during monthly pump sampling from July through September 2019. In July Corbicula juveniles were collected only at the Emergency Outfall Facility (EOF). In August they were collected at all locations. In September they were collected only at the barge slip and intake. Densities of Corbicula juveniles exceeded 1,700 individuals/m3 in the August splash pool sample. This indicates a significant population of Corbicula in the vicinity of the BVPS that could impact plant operations if steps were not taken to control the mussels.

In 2019, BVPS continued its Corbicula control program that included the use of a molluscicide to prevent the proliferation of Corbicula within BVPS. BVPS was granted permission by the PADEP to use a molluscicide to target the Unit 1 river water system and the Unit 2 service water system.

In 1990 through 1993, the molluscicide applications focused on reducing the Corbicula population throughout the entire river water system of each BVPS plant (Units 1 and 2). In 1994 and 1995, the applications targeted the internal water systems; therefore, the molluscicide concentrations in the cooling towers were reduced during applications. Consequently, adult and juvenile Corbicula in the cooling towers often survived the applications. Reservoir sediment samples taken after molluscicide applications represent mortality of Corbicula in the cooling tower only and do not reflect mortality in BVPS internal water systems.

The monthly reservoir sediment samples and pump samples collected in Units 1 and 2 Cooling Towers in recent years demonstrated that Corbicula were entering and colonizing the reservoirs. An average density of 60 live settled Corbicula/m2 was collected in the Unit 1 cooling tower and 258/m2 in the Unit 2 cooling tower in 2019. A density of 688 live Corbicula/m2 collected in the Unit 2 cooling tower reservoir in May was likely high enough to cause operational impacts if the clams were not controlled and instead were allowed to mature, grow and reproduce. Corbicula juveniles were also in the cooling tower pump samples as well as at all other pump sampling locations, which indicates that they still are available for establishment in the cooling towers. The recent decrease of Corbicula at the BVPS returns densities to levels more consistent with densities in the Ohio River in the mid-1990's, but well below those present during the 1980's. Whether the relatively low density of Corbicula in 2019 is indicative of permanent lower levels in the environment or due to natural variability is uncertain, however, and continued monitoring of Corbicula densities is recommended.

5.3.2 *Corbicula* Juvenile Monitoring

Figure 5.4 presents the abundance and size distribution data for samples collected in the Ohio River near the intake structure by petite ponar dredge in 2019. Five (5) live individuals were collected in 2019 (average of 1.7 per month), compared to four in 2018 (average of 2.0 per month) when two months were sampled and 15 in 2017 (average of 5.0 per month). In 2019, they ranged in size from the 4.75 mm to 9.49 mm size range and were likely spawned in and early 2019. A spring/early-summer spawning period typically occurs in the Ohio River near BVPS each year when preferred spawning temperatures are reached (60-65° F) (Figure 5.5). The offspring from this spawning event generally begin appearing in the sample collections in July. The settled clams then generally increase in size throughout the late summer and fall. The number of individuals collected per sampling event in 2019 was comparable to 2018 and about half of that collected in 2017. This is most likely due to normal variability in the population in the Ohio River. In any case, the densities of Corbicula continue to be low relative what was present in the 1980's.

The overall low numbers of live Corbicula collected in the samples collected outside the intake and cooling towers in 2019, compared to levels in the 1980's, likely reflects a natural decrease in the density of Corbicula in the Ohio River near BVPS, although the continued presence of Corbicula adults and juveniles near BVPS indicates that they could impact the facility if the current control program is not continued. Continued monitoring of Corbicula densities is also recommended to determine whether changes in the Corbicula populations that could impact facility operations are occurring.

5.3.3 Zebra Mussel Monitoring Program

Zebra mussels (Dreissena polymorpha and the closely related species Dreissena bugensis) are exotic freshwater mollusks that have ventrally flattened shells that are generally marked with alternating dark and lighter bands. They are believed to have been introduced into North America through the ballast water of ocean-going cargo vessels probably from Eastern Europe. They were first identified in Lake St. Clair in 1988 and rapidly spread to other Great Lakes and the Mississippi River drainage system, and have become abundant in the lower, middle, and upper Ohio River. They use strong adhesive byssal threads, collectively referred to as their byssus, to attach themselves to any hard surfaces (e.g., intake pipes, cooling water intake systems, and other mussels). Responding to NRC

Notice No. 89-76 (Biofouling Agent-Zebra Mussel, November 21, 1989), BVPS instituted a Zebra Mussel Monitoring Program in January 1990. Studies have been conducted each year since then.

Zebra mussels were detected in both the pump samples (Figures 5.6 and 5.7) and the substrate samples (Figure 5.8 and 5.9) in 2019. Veligers were collected at all of the six sites that were sampled in 2019. Zebra mussels were collected in veliger pump samples from July through October. No veligers were collected in May or June and relatively low densities of veligers were collected in the July and October samples.

Spawning begins as water temperature reach approximately 57° F and peaks at water temperatures of 74° F. Veliger densities usually peak about two weeks after the optimum water temperature for spawning is reached. Veliger densities then fall off as veligers mature and settle, although female mussels continue to broadcast mature eggs throughout the season. River water temperatures in May and June were below 65° F, which is at the low end of the spawning range (Figure 5.5). River water temperature in July reached 75° F, which is the optimum spawning temperature.

Veligers were present at all sampled locations in July, August and September. The highest annual densities in zebra mussel veligers occurred in July at all locations except the EOF where the highest density occurred in September. The majority of these veligers were D-form, which were very recently spawned and not able to settle. The percentage of mussels capable of settling generally increased throughout the sampling season.

The greatest density of veligers was present in the sample collected from the Splash Pool in August (48,500/m3). This was greater than the highest veliger density found in 2018 (28,750/m3), but less than in 2017 (116,500/m3) and 2016 (136,250/m3). Veliger densities in 2019 were also comparable to the peak density of veligers in the five years prior to that.

In 2019, settled zebra mussels were collected only in scrape samples taken at the barge slip and the intake structure (Figures 5.8 and 5.9). The highest density of settled mussels in any sample collected was at the barge slip (106.7 mussels/m2) in the September sample. The mussels collected at the barge slip and intake structure included individuals that were capable of reproducing as well as mussels settled during 2019. The density of adult zebra mussels collected in 2019 was about four times greater than the densities collected in 2018, 2017 and 2016.

Overall, both the number of observations and densities of settled mussels in 2019 were consistent to those recorded in 2008-2018, and much higher than the preceding 5 years. Although densities of settled mussels are low compared to other populations such as the Lower Great Lakes, densities comparable to those in the Ohio River are sufficient to cause problems in the operation of untreated cooling water intake systems.

Whether the population of zebra mussels in this reach of the Ohio River will remain the same or increase cannot be determined. In any case, the densities of mussels that presently exist are more than sufficient to impact the BVPS if continued prudent monitoring and control activities are not conducted.

6.0 ZEBRA MUSSEL AND CORBICULA CONTROL ACTIVITIES

In 2019, BVPS continued its Corbicula and zebra mussel control program (31st year), which includes the use of a molluscicide to prevent the proliferation of Corbicula and zebra mussels within BVPS. BVPS was granted permission by the PADEP to use a molluscicide to target the Unit 1 river water system and the Unit 2 service water system.

In 1990 through 1993, the molluscicide applications (CT-1) focused on reducing the Corbicula population throughout the entire river water system of each BVPS plant (Units 1 and 2). In 1994 through 2006, the CT-1 or CT-2 (reformulated CT-1) applications targeted zebra mussels and Corbicula in the internal water systems; therefore, the molluscicide concentrations in the cooling towers were reduced during CT-1 or CT-2 applications. Consequently, adult and juvenile Corbicula in the cooling towers often survived the applications. Reservoir sediment samples taken after CT-1 or CT-2 applications represented mortality of Corbicula in the cooling tower only and do not reflect mortality in BVPS internal water systems. In 2007 BVPS began using Nalco H150M as the molluscicide. This product, which has the same active ingredients as the CT-2 and CT-2, was applied in the same manner.

In addition to clamicide treatments, preventive measures were taken that included quarterly cleaning of the Intake Bays. The bay cleanings are intended to minimize the accumulation and growth of mussels within the bays. This practice prevents creating an uncontrolled internal colonization habitat.

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8.0 TABLES

TABLE 5.1

BEAVER VALLEY POWER STATION (BVPS)
SAMPLING DATES FOR 2019

Study	Jan	Feb	Mar	Apr*	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Benthic Macroinvertebrate**												
Fish**												
Corbicula and Zebra Mussel					23	20	25	22	19	25		
Zebra Mussel Veliger					23	20	25	22	18	25		

* Scheduled sampling not completed in April due to access difficulties

** Not scheduled in 2019

TABLE 5.2

UNIT 1 COOLING RESERVOIR MONTHLY SAMPLING
CORBICULA DENSITY DATA FOR
2019 FROM BVPS

Collection Date	Area Sampled (sq ft)	Live or Dead	Count	Maximum Length Range (mm)	Minimum Length Range(mm)	Estimated Number (per sq m)
5/23/2019	0.25	Dead	0	---	---	0
		Live	1	3.35-4.74	3.35-4.74	43
6/20/2019	0.25	Dead	1	>9.50	>9.50	43
		Live	0	---	---	0
7/25/2019	0.25	Dead	0	---	---	0
		Live	0	---	---	0
8/22/2019	0.25	Dead	1	6.30-9.94	6.30-9.94	43
		Live	3	6.30-9.94	4.75-6.29	129
9/19/2019	0.25	Dead	5	4.75-6.29	3.35-4.74	215
		Live	3	6.30-9.94	4.75-6.29	129
10/25/2019*	---	Dead	---	---	---	---
		Live	---	---	---	---
Unit summary		**Dead**	**7**	**>9.50**	**3.35-4.74**	**60**
		Live	**7**	**6.30-9.94**	**3.35-4.74**	**60**

*Unit outage; not sampled

TABLE 5.3

UNIT 2 COOLING RESERVOIR MONTHLY SAMPLING
CORBICULA DENSITY DATA FOR
2019 FROM BVPS

Collection Date	Area Sampled (sq ft)	Live or Dead	Count	Maximum Length Range (mm)	Minimum Length Range(mm)	Estimated Number (per sq m)
5/23/2019	0.25	Dead	5	>9.50	4.75-6.29	215
		Live	16	>9.50	3.35-4.74	688
6/20/2019	0.25	Dead	0	---	---	0
		Live	2	6.30-9.94	6.30-9.94	86
7/25/2019	0.25	Dead	2	4.75-6.29	6.30-9.94	86
		Live	1	3.35-4.74	3.35-4.74	43
8/22/2019	0.25	Dead	1	3.35-4.74	3.35-4.74	43
		Live	2	6.30-9.94	4.75-6.29	86
9/19/2019	0.25	Dead	5	>9.50	6.30-9.94	215
		Live	12	>9.50	4.75-6.29	516
10/25/2019	0.25	Dead	2	>9.50	4.75-6.29	86
		Live	3	3.35-4.74	3.35-4.74	129
Unit summary		**Dead**	**15**	**>9.50**	**3.35-4.74**	**108**
		Live	**36**	**>9.50**	**3.35-4.74**	**258**

9.0 FIGURES

Figure 5.1 Location of study area: Beaver Valley Power Station (BVPS), Shippingport, PA

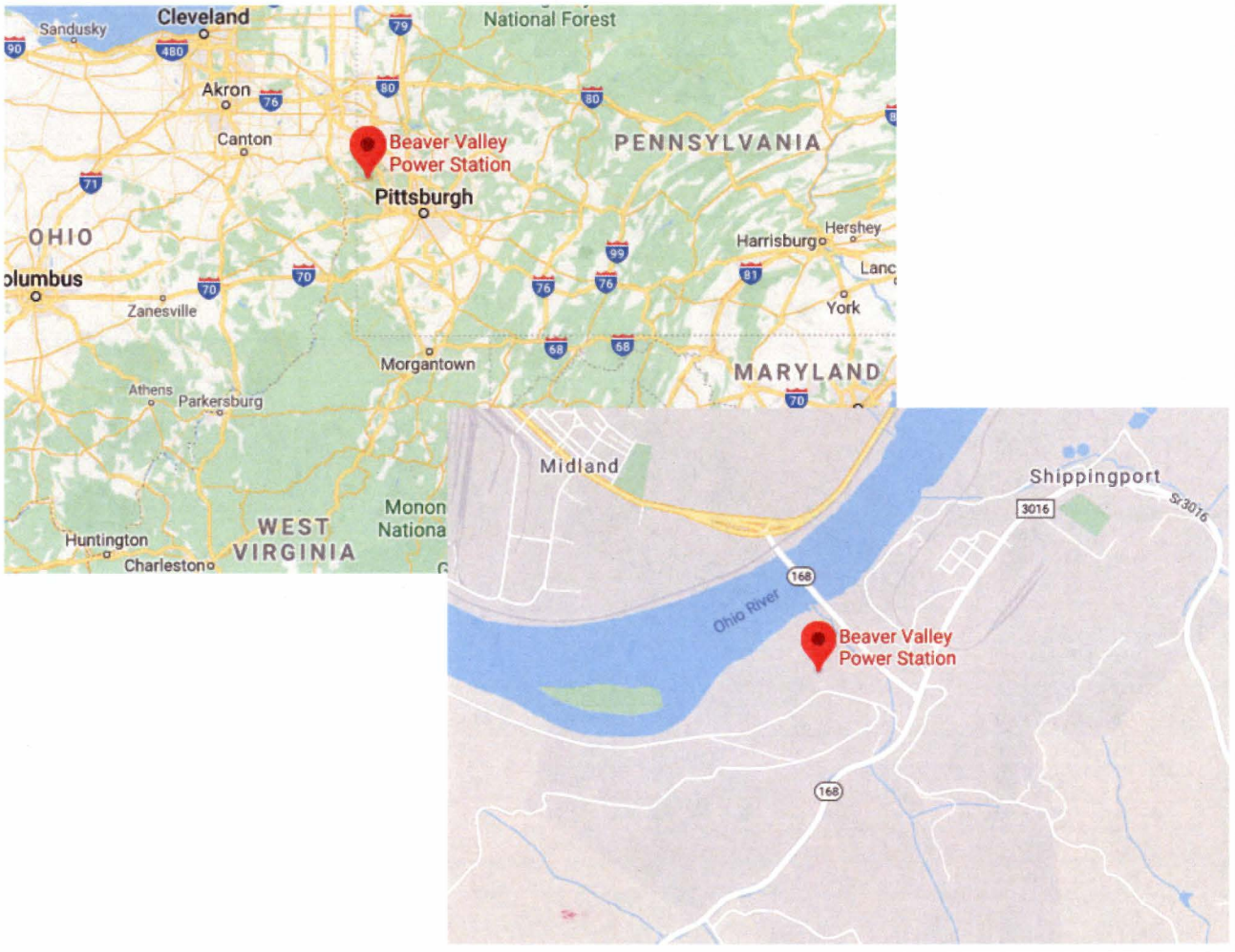
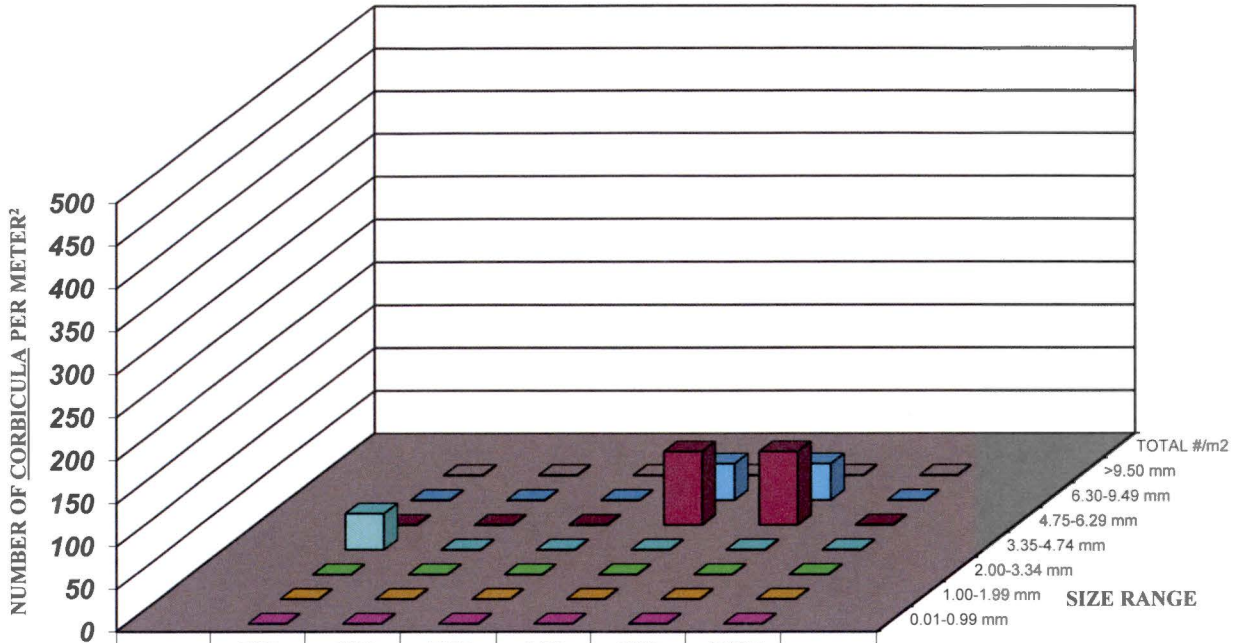


Figure 5.2

Comparison of live Corbicula clam density estimates among 2019 BVPS Unit 1 cooling tower reservoir events, for various clam shell groups.

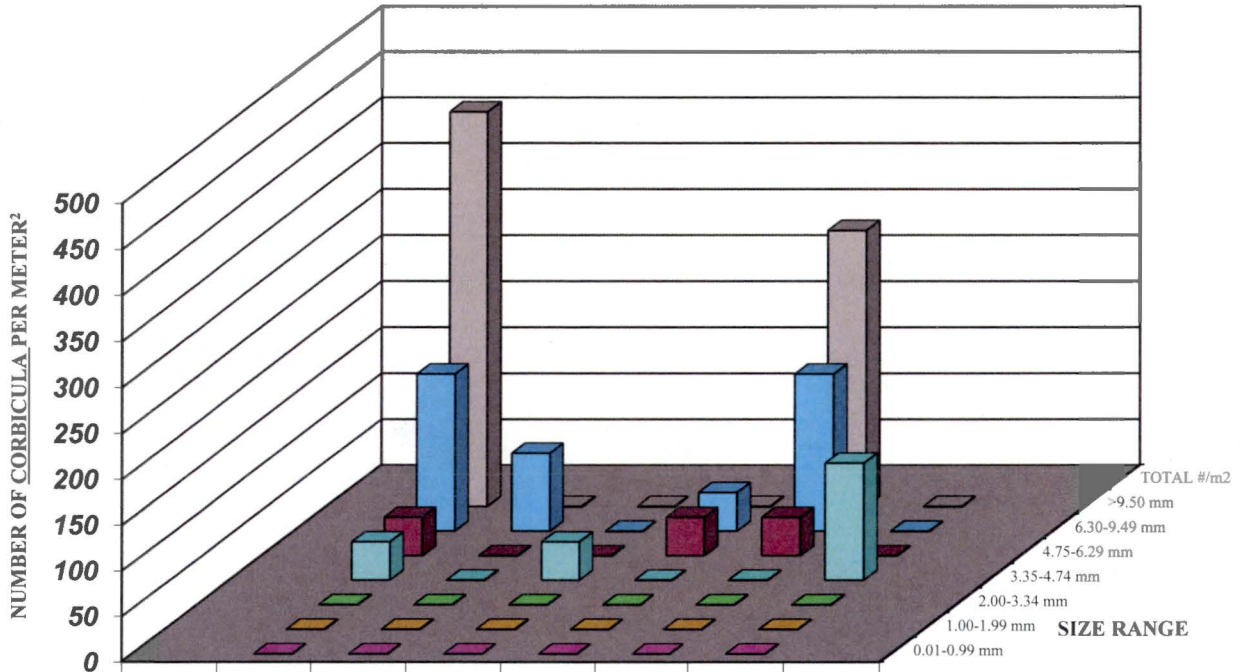


	5/23	6/20	7/25	8/22	9/19	10/25*
0.01-0.99 mm	0	0	0	0	0	0
1.00-1.99 mm	0	0	0	0	0	0
2.00-3.34 mm	0	0	0	0	0	0
3.35-4.74 mm	43	0	0	0	0	0
4.75-6.29 mm	0	0	0	86	86	0
6.30-9.49 mm	0	0	0	43	43	0
>9.50 mm	0	0	0	0	0	0
TOTAL #/m2	43	0	0	129	129	0

*Not sampled in October due to outage

Figure 5.3

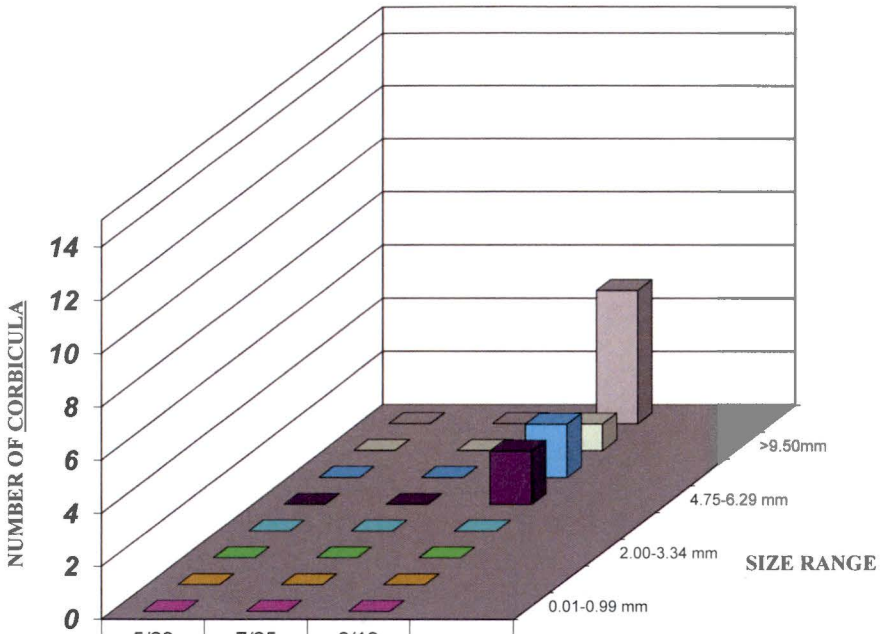
Comparison of live Corbicula clam density estimates among 2019 BVPS Unit 2 cooling tower reservoir events, for various clam shell groups.



	5/23	6/20	7/25	8/22	9/19	10/25
0.01-0.99 mm	0	0	0	0	0	0
1.00-1.99 mm	0	0	0	0	0	0
2.00-3.34 mm	0	0	0	0	0	0
3.35-4.74 mm	43	0	43	0	0	129
4.75-6.29 mm	43	0	0	43	43	0
6.30-9.49 mm	172	86	0	43	172	0
>9.50 mm	430	0	0	0	301	0
TOTAL #/m2	688	86	43	86	516	129

Figure 5.4

Comparison of live Corbicula clam density estimates among 2019 BVPS Intake Structure sample events, for various clam shell groups.



	5/23	7/25	9/19
0.01-0.99 mm	0	0	0
1.00-1.99 mm	0	0	0
2.00-3.34 mm	0	0	0
3.35-4.74 mm	0	0	0
4.75-6.29 mm	0	0	2
6.30-9.49 mm	0	0	2
>9.50mm	0	0	1
TOTAL	0	0	5

*Intake structure bottom samples are collected from the Ohio River at the Intake Building.

Figure 5.5

Water Temperature and River Elevation Recorded at the Ohio River at BVPS Intake Structure During 2019 on Monthly Sample Dates.

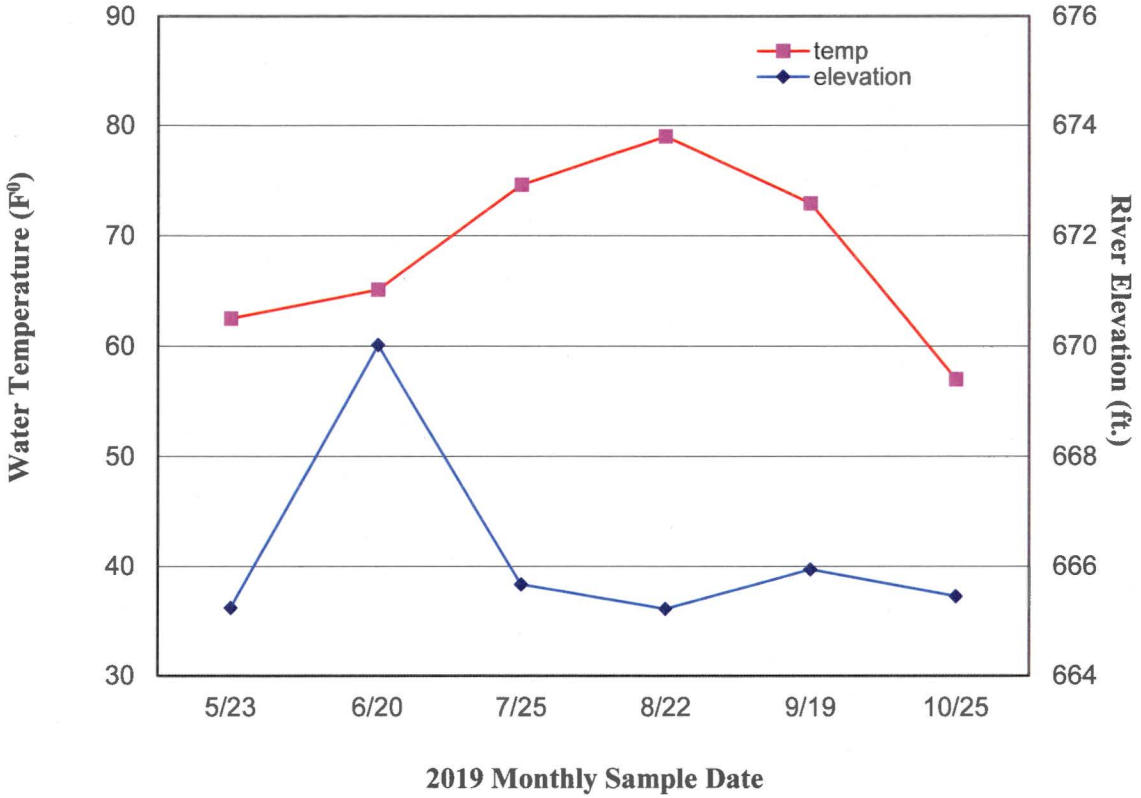
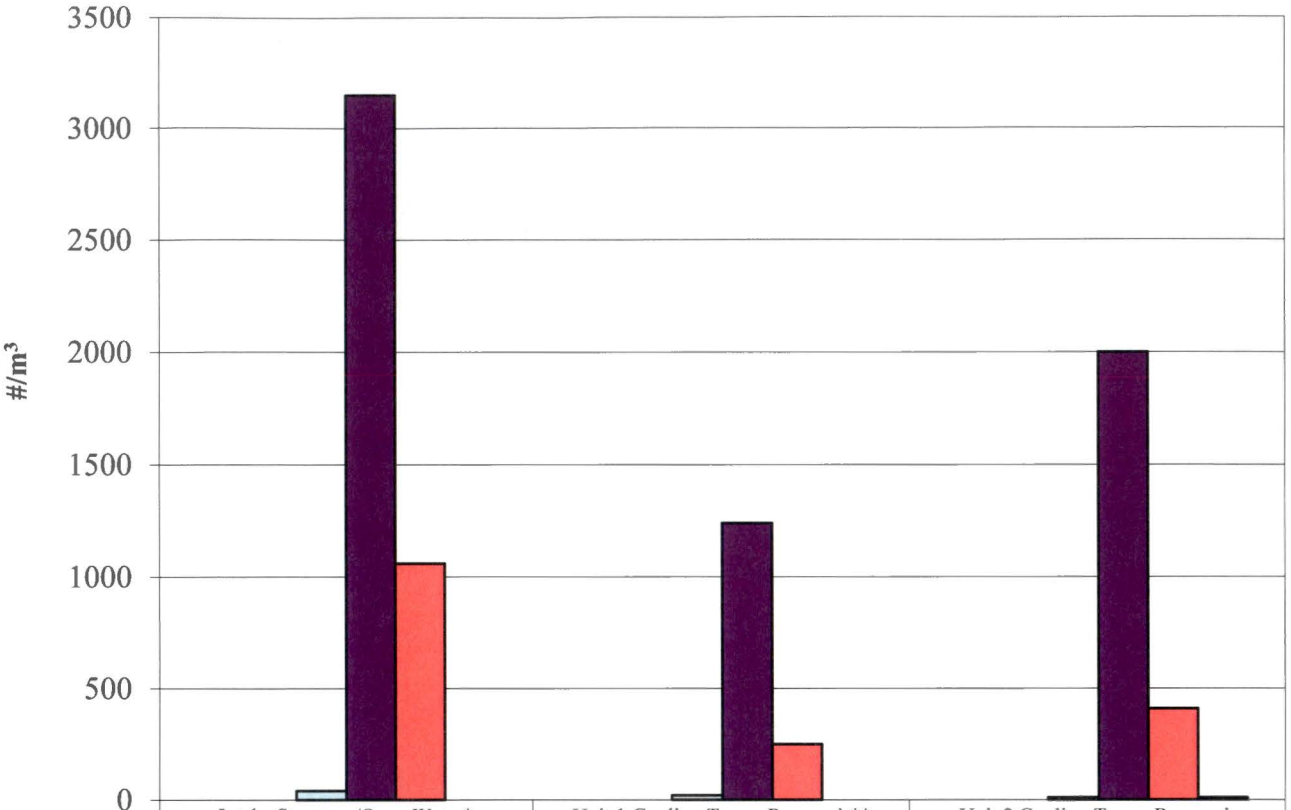


Figure 5.6

Density of zebra mussel veligers collected at Beaver Valley Power Station, 2019.



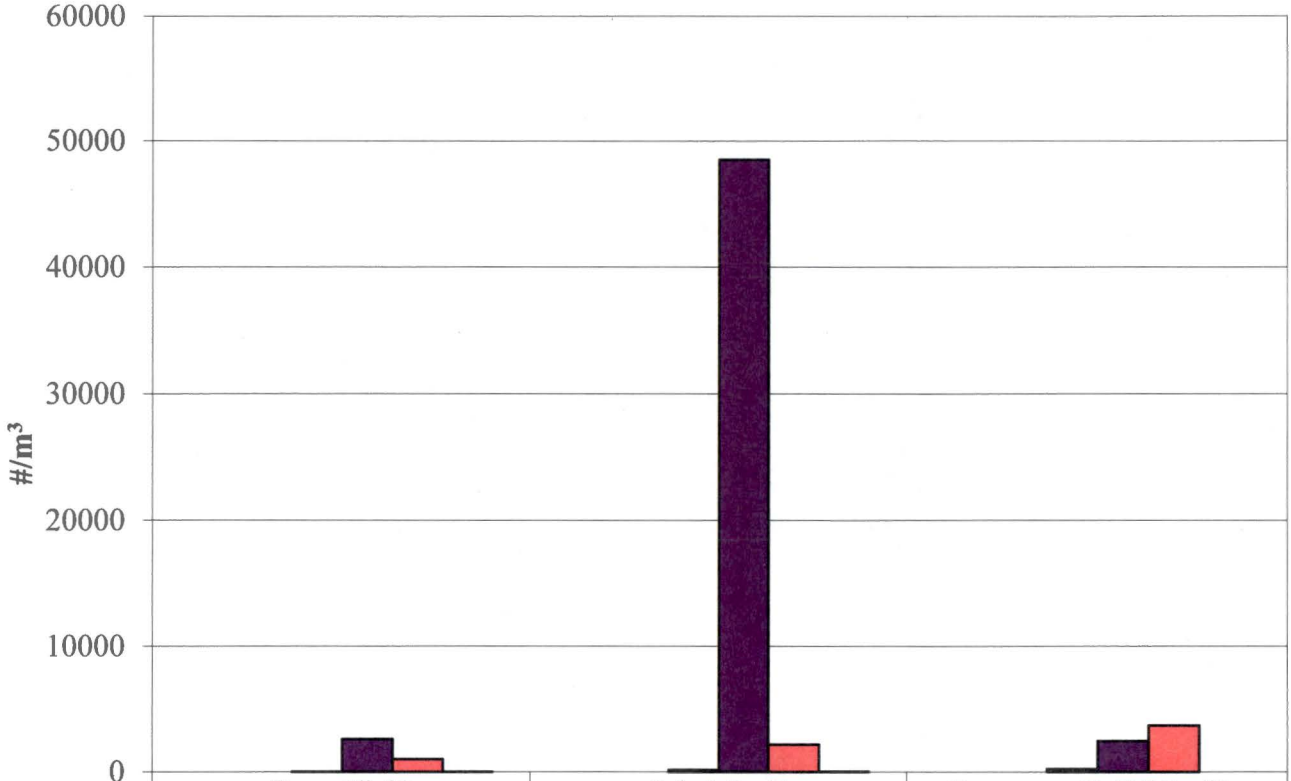
	Intake Structure/Open Water*	Unit 1 Cooling Tower Reservoir**	Unit 2 Cooling Tower Reservoir
5/23	0	0	0
6/20	0	0	0
7/25	40	20	10
8/22	3150	1240	2000
9/19	1060	250	410
10/25	0	0	10

Sample location

*Intake Structure/Open Water not sampled in June due to high water
**Cooling Tower 1 not sampled in October due to scheduled outage

Figure 5.7

Density of zebra mussel veligers collected at Beaver Valley Power Station, 2019.



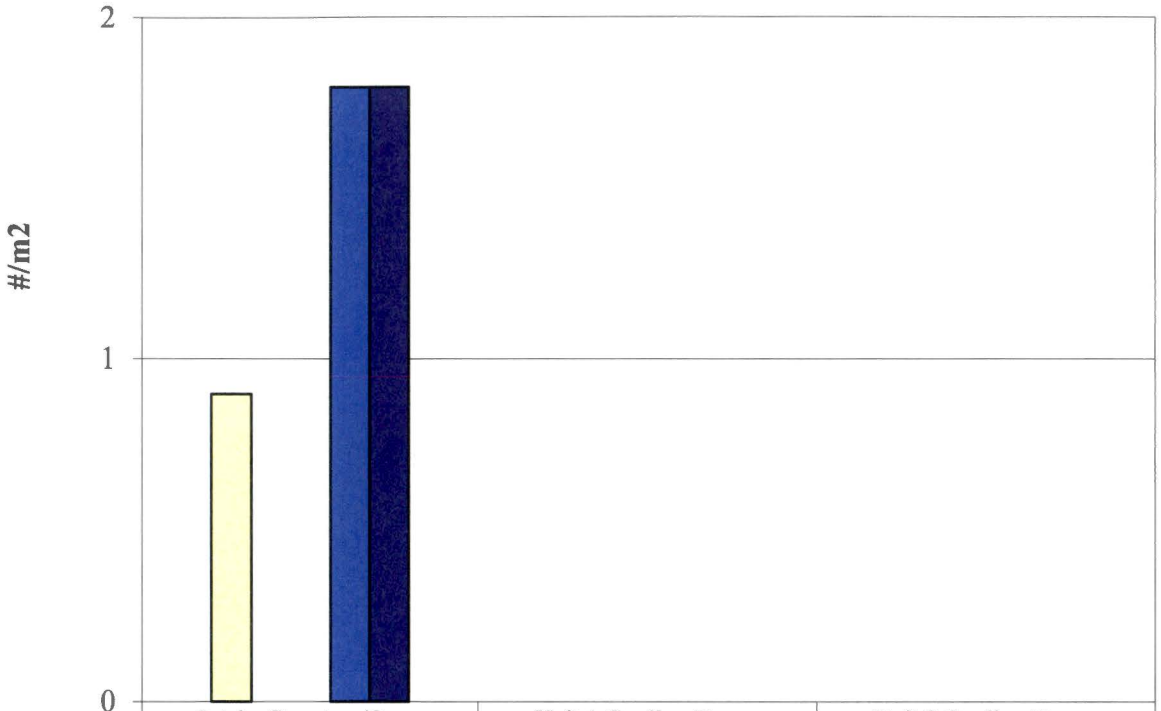
	Barge Slip**	Splash Pool*	Emergency Outfall Facility
5/23	0	0	0
6/20	0	0	0
7/25	10	150	220
8/22	2610	48500	2460
9/19	1022	2180	3690
10/25	10	20	0

Sample location

*Splash Pool not sampled in May or June due to fast moving water posing a safety concern
**Barge Slip not sampled in June due to high water

Figure 5.8.

Density of settled zebra mussels at Beaver Valley Power Station, 2019.



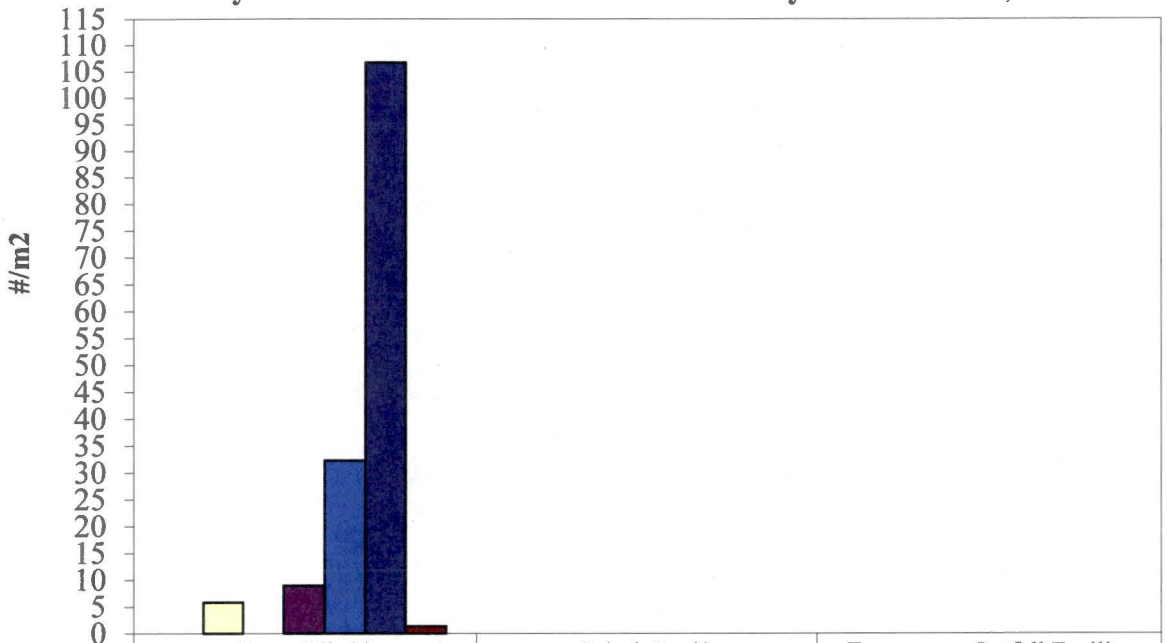
	Intake Structure/Open Water*	Unit 1 Cooling Tower Reservoir**	Unit 2 Cooling Tower Reservoir
5/23	0.9	0.0	0.0
6/20	0.0	0.0	0.0
7/25	0.0	0.0	0.0
8/22	1.8	0.0	0.0
9/19	1.8	0.0	0.0
10/25	0.0	0.0	0.0

Sample location

*Intake Structure/Open Water not sampled in June due to high water
**Cooling Tower 1 not sampled in October due to scheduled outage

Figure 5.9

Density of settled zebra mussels at Beaver Valley Power Station, 2019.



	Barge Slip**	Splash Pool*	Emergency Outfall Facility
5/23	5.83	0.00	0.00
6/20	0.00	0.00	0.00
7/25	8.97	0.00	0.00
8/22	32.29	0.00	0.00
9/19	106.73	0.00	0.00
10/25	1.35	0.00	0.00

Sample Location

*Splash Pool not sampled in May or June due to fast moving water posing a safety concern
**Barge Slip not sampled in June due to high water

10.0 PERMITS

BEAVER VALLEY POWER STATION (BVPS)
PERMITS AND CERTIFICATES FOR ENVIRONMNETAL COMPLIANCE

Registration Number	Regulator/Description	Expiration
PAR000040485	BVPS EPA generator identification Resource Conservation & Recovery Act (RCRA) Identification number for regulated waste activity. Also used by PA DEP to monitor regulated waste activity under the Pennsylvania Solid Waste Management Act (SWMA)	Indefinite
04-02474	BVPS EPA Facility Identification Number for CERCLA/EPCRA/SARA. Used for SARA Tier II reporting and emergency planning.	Indefinite
04-02475	FE Long Term Distribution Center/Warehouse (22) EPA Facility Identification Number for CERCLA/EPCRA/SARA. Used for Sara Tier II reporting and emergency planning.	Indefinite
PA0025615	BVPS NPDES Permit Number under US EPA and PA DEP.	12/27/2006 *Continued, Pending approval of renewal application*
04-13281	BVPS Unit 1 PA DEP Facility Identification & certification number for regulated storage tanks.	Indefinite
04-13361	BVPS Unit 2 PA DEP Facility Identification & certification number for regulated storage tanks.	Indefinite
OP-04-00086	PA DEP State Only Synthetic Minor Permit for emergency auxiliary boilers, emergency diesel generators, paint shop and other miscellaneous sources.	4/28/2020 *Continued, Pending approval of renewal application*
N/A	PA DEP Open Burning Permit for operation of the BVPS Fire School – annual application and renewal.	1/1/2021
042009 450 002RT	US Department of Transportation Hazardous Materials Registration.	12/31/2021
200100242	US Army Permit for maintenance dredging (with Encroachment/Submerged Lands Agreement #0477705, this allows maintenance dredging).	10/21/2021
477705	Encroachment Permit/Submerged Lands Agreement for construction and maintenance of current barge slip (with US Army Permit #2000100242, this allows maintenance dredging).	Indefinite
06786A	Encroachment Permit/Submerged Lands Agreement for transmission line over Ohio River at Mile 34.5.	Indefinite
18737	Encroachment Permit/Submerged Lands Agreement for Unit 1 intake and discharge (main combined intake and outfall structures).	Indefinite
475711	Encroachment Permit/Submerged Lands Agreement for construction and maintenance of Unit 2 auxiliary line.	Indefinite