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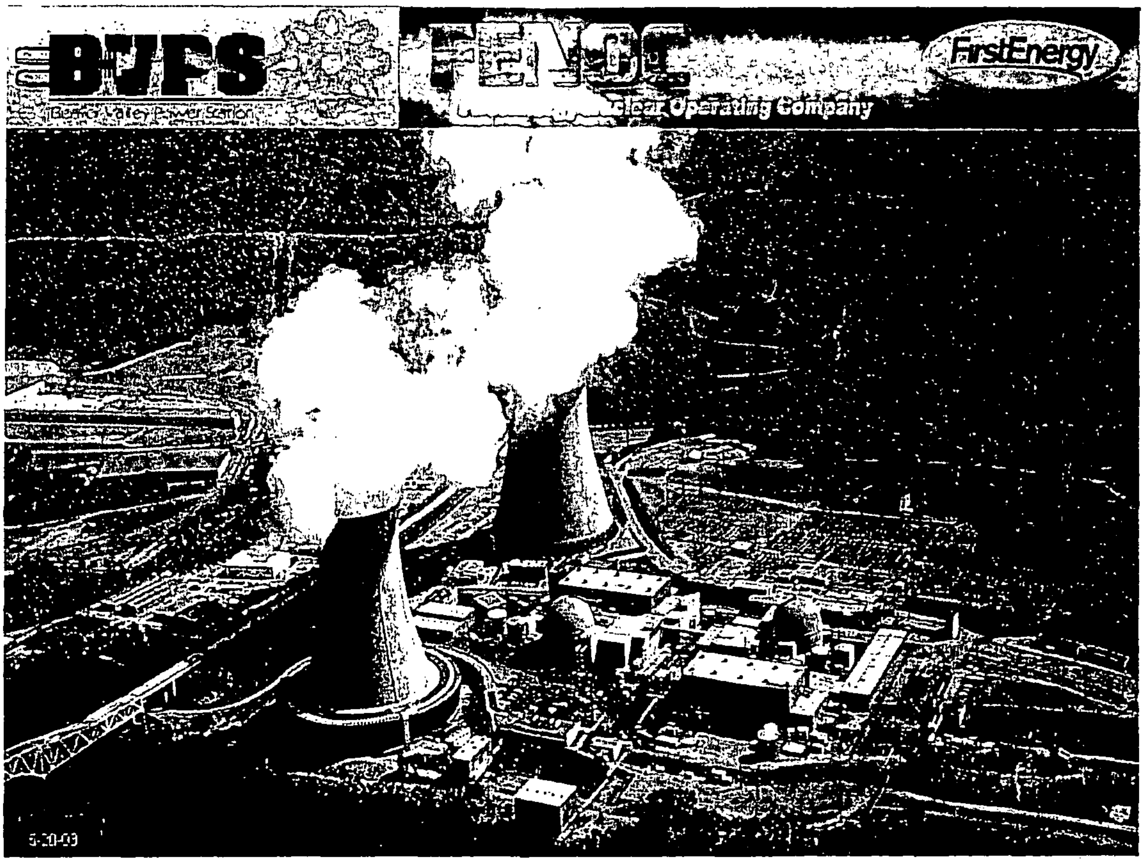
BEAVER VALLEY POWER STATION



2006 ANNUAL ENVIRONMENTAL OPERATING REPORT
NON-RADIOLOGICAL
UNITS NO. 1 AND 2
LICENSES DPR-66 AND NPF-73

BEAVER VALLEY POWER STATION

ENVIRIONMENTAL & CHEMISTRY SECTION

Technical Report Approval:

2006 ANNUAL 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 FirstEnergy Nuclear Operating Company (FENOC). The Objectives of the Environmental Protection Plan (EPP) are:

- 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 NRC environmental impact assessments.
- Coordinate NRC requirements and maintain consistency with other Federal, State, and local requirements for environmental protection.
- Keep 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, FirstEnergy Corporation, FENOC, 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 (PA DEP) 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 registrations 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 FENOC Problem Identification and Resolution Program with a Condition Report. Condition Reports include investigations, cause determinations, and corrective actions.

During 2006 BVPS continued an Aquatic Monitoring Program to evaluate its potential impact on the New Cumberland Pool of the Ohio River, and to provide information on potential impacts to BVPS operation from macrofoulers such as Asian clams and Zebra mussels.

1.2 SUMMARY AND CONCLUSIONS

There were no significant environmental events during 2006. One release of approximately 6 1/4 gallons of ethylene glycol occurred that, though reported to the PA DEP, caused no significant impact to the environment, and is detailed in Section 4.0 of this report.

During 2006, no significant changes to operations that could affect the environment were made at Beaver Valley Power Station. ***As in previous years, results of the BVPS environmental programs did not indicate any adverse environmental impacts from station operation.***

1.3 ANALYSIS OF SIGNIFICANT ENVIRONMENTAL CHANGE

During 2006, no significant changes to were made at BVPS to cause significant negative affect on the environment.

1.4 AQUATIC MONITORING PROGRAM

The 2006 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. The Aquatic Program is 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 31st year of operational environmental monitoring for Unit 1 and the 20th year for Unit 2. As in previous years, the results of the program did not indicate any adverse environmental impact to the aquatic life in the Ohio River associated with the operation of BVPS.

The results of the 2006 benthic macroinvertebrate survey conducted in May and September indicated a normal community structure exists in the Ohio River both upstream and downstream of the BVPS. These benthic surveys are also a continuation of a Fate and Effects Study conducted from 1990 through 1992 for the Pennsylvania Department of Environmental Protection (PADEP) to assess the ecosystem impacts of the molluscicides Betz Clamtrol CT-1, CT-2, and Powerline 3627 that are used to control biofouling organisms at BVPS. To date the results of the benthic studies have not indicated any impacts of operation at the BVPS including the use these biocides on the benthic community below the BVPS discharge.

Substrate was probably the most important factor influencing the distribution and abundance of the benthic macroinvertebrates in the Ohio River near BVPS. Soft muck-type substrate along the shoreline found in 2006 and previous years was conducive to segmented worm (oligochaete) and midge (chironomid) proliferation. Thirty nine (39) macroinvertebrate taxa were identified during the 2006 monitoring program. Three taxa were added to the cumulative taxa list of macroinvertebrates collected near BVPS. All three were species of snails. Two, *Stagnicola elodes and Pleurocera acuta,* are native to North America. The third, *Gillia atillis,* is an introduced non-indigenous species of snail that is extending its range in North American fresh waters. This species is unlikely to have any impacts on operation of the BVPS. No state or Federal threatened or endangered macroinvertebrate species were collected during 2006. In May and September, oligochaetes were the most frequently collected group of macroinvertebrate. ***There were no major differences in the community structure between control and non-control stations that could be attributed to operation of BVPS. The overall community structure has changed little since pre-operational years, and program results did not indicate that BVPS operations were affecting the benthic community of the Ohio River.***

The fish community of the Ohio River near the BVPS was sampled in May, July, September and November of 2006 with night electrofishing and daytime seining. Since monitoring began in the early 1970's, the number of identified fish taxa has increased from 43 to 78 for the New Cumberland Pool.

Benthivores (bottom feeders including suckers and buffalo) were collected in the highest numbers in 2006. Forage species, although common, were collected in lower numbers than in recent years. Variations in annual catch were probably attributable to normal fluctuations in the population size of the forage species and the predator populations that rely on them. Forage species, such as gizzard shad and emerald shiner with high reproductive potentials, frequently respond to changes in natural environmental factors (competition, food availability, cover, and water quality) with large fluctuations in population size, which may be the reason for the lower numbers of these species observed in 2006. This, in turn, influences their appearance in the sample populations during annual surveys. Spawning/rearing success due to abiotic factors is usually the determining factor of the size and composition of a fish community.

The catch per unit effort (number of fish per minute of effort, or CPUE) for electrofishing in 2006 was 1.60 fish/min. The annual catch rates were consistent over the three years ranging from a high of 1.73 fish per minute in 2005 to 1.27 in 2004. In 2004 the lowest catch rate was in the fall whereas in 2005 and 2006 the lowest catch rate was during the summer survey

Little difference in the species composition of the catch was observed between the control (Station 1) and non-control (Stations 2A, 2B and 3). Habitat preference and availability were probably the most important factors affecting where and when fish were collected. ***Results from the 2006 fish surveys indicated that a normal community structure for the Ohio River exists near BVPS based on species composition and relative abundance. In 2006, there was no indication of negative impact to the fish community in the Ohio River from the operation of BVPS.***

The monthly reservoir Ponar samples collected in Units 1 and 2 cooling towers and the four samples collected at the intake during 20065 indicated that *Corbicula* were entering and colonizing the station. ***Overall, the numbers of Corbicula collected in the samples were comparatively low, which continued the trend over the past few years of fewer Corbicula and reflected a water-body-wide trend observed in the Ohio River.***

In 1995, live zebra mussels were collected for the first time by divers in the BVPS main intake and auxiliary intake structures during scheduled cleanings. Overall, both the number of observations and densities of settled mussels were similar in 2006, 2005 and 2004. The density of veligers in 2006 was much higher than in 2005 and 2004 but was comparable but 2003. 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 zebra mussel populations in this reach of the Ohio River are resurging or if only yearly fluctuations are present cannot be determined. In either case, the densities of mussels that presently exist are more than sufficient to impact BVPS.***

2.0 ENVIRONMENTAL PROTECTION PLAN NON-COMPLIANCES

There were no Environmental Protection Plan non-compliances identified in 2006.

3.0 CHANGES INVOLVING UNREVIEWED ENVIRONMENTAL QUESTIONS

No Unreviewed Environmental Questions were identified in 2006. Therefore, there were no changes involving an Unreviewed Environmental Question.

4.0 NONROUTINE ENVIRONMENTAL REPORTS

During 2006, BVPS made one non-routine environmental report and required associated follow-up report to the PA DEP.

NOTE: Required routine reports under the National Pollutants Discharge Elimination System (NPDES) are not included in this section. They are included with the applicable submittal of the monthly Discharge Monitoring Reports (DMR). Copies of DMRs and attached reports are submitted to the USNRC, and are, therefore, not included in this report. A copy of the following described report was submitted to the USNRC Document Control Desk under Letter No. L-06-129 on August 11, 2006.

4.1 Approximately 6 1/4 Gallons of Ethylene Glycol Released Via Outfall 003:

On August 11, 2006, we submitted to the Pennsylvania Department of Environmental Protection (PA DEP) a five-day written follow-up report regarding a condition we reported by telephone on August 10, 2006. In our telephone notification, we reported that approximately 12.5 gallons of chilled water containing 50% concentration of ethylene glycol antifreeze was discharged to the Ohio River via Outfall 003. In an abundance of caution, we chose to call immediately upon determining that a water/ethylene glycol solution had entered into the Outfall 003 system, in accordance with NPDES Permit No. PA0025615, Part A. Reporting Requirements.

On August 9, 2006 at approximately 8:40 AM, an operator during a routine tour discovered a dropped level of chilled water in chiller (air conditioning) unit 1AC-85. By 10:00 AM, it was determined that an estimated 12.5 gallons of chilled water leaked from a temperature control bypass valve and flowed into a floor drain leading to the Unit 1 Turbine Building sumps. A review of plant drawings indicated the final flow path would be to the combined process and stormwater system discharged via Outfall 003. In response, the leak was isolated at the unit, the turbine building sumps were isolated to prevent further flow, and the area near the Outfall 003 discharge was inspected. No evidence of environmental harm or impact was observed at the discharge point to the Ohio River.

In accordance with site procedures identified in our Environmental Emergency Response Plan, we determined that the incident did not involve a glycol release above the CERCLA Reportable Quantity (RQ = 5,000 pounds) as the maximum estimated amount was 58 pounds leaked over an 8 hour period. Based on the volume of 50% ethylene glycol-chilled water lost (~12.5 gallons), and an average estimated combined process and stormwater system flow rate through Outfall

003 (118,000 gallons per day), we estimated the discharge concentration of ethylene glycol to be 0.16 mg/l.

A work notification was written to repair the leaking valve. Further, the incident is documented and investigated under the FENOC Problem Identification and Resolution Program under Condition Report CR-06-04754.

5.0 AQUATIC MONITORING PROGRAM

This section of the report summarizes the Non-Radiological Environmental Program conducted for the BVPS 1 Units 1 and 2; Operating License Numbers DPR-66 and NPF-73. This is a non-mandatory program, because on February 26, 1980, the Nuclear Regulatory Commission (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. However, in the interest of providing an uninterrupted database, BVPS has continued the Aquatic Monitoring Program.

The objectives of the 2006 environmental program were:

- To monitor for any possible environmental impact of BVPS operation on the benthic macroinvertebrate and fish communities in the Ohio River;
- To provide a low level sampling program to continue an uninterrupted environmental database for the Ohio River near BVPS, pre-operational to present; and
- To evaluate the presence, growth, and reproduction of macrofouling *Corbicula* (Asiatic clam) and zebra mussels (*Dreissena* spp.) at BVPS.

5.1 SITE DESCRIPTION

BVPS is located on an approximately 466-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 3,100.

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, which has a gradual slope that extends from the river at approximately eElevation 660 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 currently completing licensed uprates, have a thermal rating of 2,900 megawatts (MW). Post uprate, Units 1 & 2 will have an electrical rating of 924 MWe and 917 MWe, 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 STUDY AREA

The environmental study area, established to assess potential impacts, consists of four sampling stations each having a north and south shore (Figure 5.1). Station 1 is located at River Mile (RM) 34.5, approximately 0.3 mile (0.5 km) upstream of BVPS and is the control station. Station 2A is located approximately 0.5 mile (0.8 km) downstream of the BVPS discharge structure in the main channel. Station 2B is located in the back channel of Phillis Island, also 0.5 mile downstream of the BVPS discharge structure. Station 2B is the principal non-control station because the majority of discharges from BVPS Units 1 and 2 are released to this back channel. Station 3 is located approximately two miles (3.2 km) downstream of BVPS

5.3 METHODS

Shaw Environmental and Infrastructure, Inc. (Shaw) was contracted to perform the 2006 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.

5.3.1 Benthic Macroinvertebrate Monitoring

The benthic macroinvertebrate monitoring program consisted of river bottom sampling using a Ponar grab sampler at four stations on the Ohio River. Prior to 1996, duplicate sampling occurred at Stations 1, 2A, and 3, while triplicate sampling occurred at Station 2B (i.e., one sample at each shoreline and mid-channel) (Figures 5.1 and 5.2). In 1996, a review of the sampling design indicated that sampling should be performed in triplicate at each station to conform to standardized U.S. Environmental Protection Agency (USEPA) procedures. Therefore, starting in 1996, triplicate samples were taken at Stations 1, 2A, and 3, as in 1995, with triplicate samples also collected at each shore and mid-channel location at Station 2B. A petite Ponar dredge was used to collect these samples, replacing the standard Ponar dredge used in prior studies. This sampling was conducted in May and September 2006. For each 2006 field effort, 18 benthic samples were collected and processed in the laboratory. All field procedures and data analyses were conducted in accordance with the procedural guide.

The contents of each Ponar grab sample were gently washed through a U.S. Standard No. 30 sieve and the retained contents were placed in a labeled bottle and preserved in ethanol. In the laboratory, rose bengal stain was added to aid in sorting and identifying the benthic organisms. Macroinvertebrates were sorted from each sample, identified to the lowest taxon practical and counted. Mean density (number/m^2) for each taxon was calculated for each replicate. Four indices used to describe the benthic community were calculated: Shannon-Weiner diversity index, evenness (Pielou, 1969), species richness, and the number of taxa. These estimates provide an indication of the relative quality of the macroinvertebrate community.

5.3.2 Fish Monitoring

Fish sampling was conducted in 2006 to provide a continuous baseline of data and to detect possible changes that may have occurred in the fish populations in the Ohio River near BVPS. Fish population surveys have been conducted in the Ohio River near BVPS annually from 1970 through 2006. These surveys have resulted in the collection of 73 fish species and five different hybrids.

Adult fish surveys were scheduled and performed in May, July, September, and November 2006. During each survey, fish were sampled by standardized electrofishing techniques at four stations (Stations 1, 2A, 2B and 3) (Figure 5.3). Seining was performed at Station 1 (north shore) and Station 2B (south shore of Phillis Island), to sample species that are generally under-represented in electrofishing catches (e.g., young-of-the-year fish and small cyprinids).

Night electrofishing was conducted using a boat-mounted electroshocker with floodlights attached to the bow. A Smith-Root Type VI A variable voltage, pulsed-DC electrofishing unit powered by a 5-kW generator was used. The voltage selected depended on water conductivity and was adjusted to provide a constant amperage (4-6 amps) of the current through the water. The north and south shoreline areas at each station were shocked for at least 10 minutes of unit "on" time (approximately five minutes along each shore) during each survey.

When large schools of fish of a single non-game species such as gizzard shad and shiners were encountered during electrofishing efforts, all of the stunned fish were not netted and retrieved onboard the boat. A few fish were netted for verification of identity, and the number of observed stunned fish remaining in the water was estimated. The size range of the individual fish in the school was also estimated and recorded. This was done in an effort to expedite sample processing and cover a larger area during the timed electrofishing run. Regardless of the number of individuals, all game fish were boated when observed.

Fish seining was performed at Station 1 (control) and Station 2B (non-control) during each scheduled 2006 BVPS fishery survey. A 30-ft long bag seine made of 1/4-inch nylon mesh netting was used to collect fish located close to shore in 1 to 4 ft of water. Three seine hauls were performed at both Station 1 (north shore) and Station 2B (south shore of Phillis Island) during each survey.

Fish collected during electrofishing and seining efforts were processed according to standardized procedures. All captured game fishes were identified, counted, measured for total length (nearest 1 mm), and weighed (nearest 1 g for fish less than or equal to 1000 g and the nearest 5 g for all other fish). Non-game fishes were counted, and a random subsample of lengths was taken. Live fish were returned to the river immediately after processing was completed. All fish that were unidentifiable or of questionable identification and were obviously not on the endangered or threatened species list were placed in plastic sample bottles, preserved, labeled and returned to the laboratory for identification. Any species of fish that had not previously been collected at BVPS was retained for the voucher collection. Any threatened or endangered species (if collected) would be photographed and released.

5.3.3 *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). This report describes this Monitoring Program and the results of the field and plant surveys conducted in 2006.

The objectives of the ongoing Monitoring Program are to evaluate the presence of *Corbicula* at BVPS, and to evaluate the potential for and timing of infestation of the BVPS. This program is conducted in conjunction with a program to monitor for the presence of macrofouling zebra mussels (see Section 5.3.5).

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. 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.

The Cooling Tower Reservoir Sampling was historically conducted once per month, annually. Beginning in December 1997, it was decided to forego sampling in cold water months since buildup of *Corbicula* does not occur in then. Monthly sampling has been maintained throughout the warmer water months of the year. In 2006 sampling began in April.

In 2006, once each month (April through November), 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.

Population surveys of both BVPS cooling tower reservoirs had been conducted during scheduled outages (1986 through 2005) to estimate the number of *Corbicula* present in these structures.

During the scheduled shutdown period for each unit, each cooling tower reservoir bottom is sampled by petite Ponar at standardized locations within the reservoir. Counts of live and dead clams and determination of density were made. The data, though interesting early in the program, provided little value. Therefore, in 2006 the program administrator decided to eliminate that task from the program until such time that the data may again be of value.

5.3.4 *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.

Observational-based concerns that the clam cages could quickly clog with sediment during high sediment periods and, as a result, not sample effectively, led to an evaluation of an alternate sampling technique. From April through June 1997, a study was conducted to compare the results of the clam cage samplers to a petite Ponar dredge technique to determine *Corbicula* presence and density in the BVPS intake bays. It was hypothesized that using a Ponar sampler to collect bottom sediments and analysis of those sediments would provide a more representative sample of *Corbicula* settlement and growth rates, and had the added benefit of not requiring confined space entry to conduct the sampling. Results of the study confirmed this hypothesis.

During the 1998 sampling season, at the request of BVPS personnel, all clam cages were removed after the May 18th 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 5.3.3).

From 2002 to present, because of site access restrictions, the sampling with the petite Ponar has been moved to the Ohio River directly in front of the Intake Structure Building. Collections are presently made in conjunction with the fisheries sampling (May, July, September, and November). During each sampling month two Ponar grabs are taken approximately 20 feet off shore of the intake building. These grab samples are processed in the same manner as when they were collected from within the Intake Structure Building.

5.3.5 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 were:

(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, yearlong. Beginning in December 1997, it was decided to forego sampling in the colder water months of each year, since buildup of zebra mussels, does not occur then. Monthly sampling has been maintained throughout the balance of the year. In 2006 sampling occurred from April through November.

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 and emergency outfall impact basin locations were also added. Additional pump samples were collected from the cooling tower of Unit 1 and Unit 2 in October 1998. In 2006 veliger sampling began in April and was 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 (April through November) 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 (April through October).

At each of the Cooling Towers the following techniques were used:

- Monthly reservoir scraper sample collections in each cooling tower (April through November); and

- Pump samples in April through October to detect planktonic life forms.

At the Emergency Outfall and the Splash Pool the following techniques were used:

- Monthly scraper sample collections in each (April through November); and

- Pump samples in each from April through October to detect planktonic life forms.

5.3.6 <u>Reports</u>

Each month, activity reports that summarized the activities that took place the previous month were prepared and submitted. These reports included the results of the monthly *Corbicula*/zebra mussel monitoring including any trends observed and any preliminary results available from the benthic and fisheries programs. The reports addressed progress made on each task, and reported any observed biological activity of interest.

5.4 RESULTS OF THE AQUATIC MONITORING PROGRAM

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.

5.4.1 Benthic Macroinvertebrate Monitoring Program

Benthic surveys were scheduled and performed in May and September 2006. Benthic samples were collected at Stations 1, 2A, 2B, and 3 (Figure 5.2), using a petite Ponar grab sampler. Triplicate samples were taken off the south shore at Stations 1, 2A, and 3. Sampling at Station 2B, in the back channel of Phillis Island, consisted of triplicate petite Ponar grabs at the south side, middle, and north side of the channel (i.e., Sample Stations 2B1, 2B2, and 2B3, respectively).

Substrate type is an important factor in determining the composition of the benthic community. The habitats in the vicinity of BVPS are the result of damming, channelization, and river traffic. Shoreline habitats at the majority of sampling locations were generally soft muck substrates composed of sand, silt, and detritus. An exception was along the north shoreline of Phillis Island at Station 2A where hard pan clay dominated. The other distinct habitat, hard substrate (gravel and cobble), was located in mid-channel of the back channel of Phillis Island. The hard substrate was probably the result of channelization and scouring by river currents.

Thirty nine (39) macroinvertebrate taxa were identified during the 2006 monitoring program (Tables 5.2 and 5.3). A mean density of 786 macroinvertebrates/m^2 was collected in May and 1,335/m^2 in September (Table 5.4). As in previous years, the macroinvertebrate assemblage during 2006 was dominated by burrowing organisms typical of soft unconsolidated substrates. Oligochaetes (segmented worms), mollusks (clams and snails) and chironomid (midge fly) larvae were abundant (Table 5.4).

Twenty-seven (27) taxa were present in the May samples, and thirty (30) taxa in the September samples (Table 5.3.1 and 5.3.2). Seventeen (17) of the 40 taxa were present in both May and September.

The Asiatic clam (*Corbicula*) has been observed in the Ohio River near BVPS from 1974 to present. Zebra mussels were first collected in the BVPS benthic samples in 1998. Adult zebra mussels, however, were detected in 1995 and 1996 by divers in the BVPS main and auxiliary intake structures during scheduled cleaning operations. Zebra mussel veligers, adults and juveniles were collected during the 1997-2006 sampling programs (see Sections 5.4.5 Zebra Mussel Monitoring Program). Live *Corbicula* were collected in benthic macroinvertebrate samples in 2006. Although no live zebra mussels were collected, empty shells were common in many of the samples. Zebra mussels prefer hard substrates, not the softer substrates sampled during this macroinvertebrate survey.

In 2006, three taxa were added to the cumulative taxa list of macroinvertebrates collected near BVPS (Table 5.2). All three were species of snails. Two, *Stagnicola elodes and Pleurocera acuta,* are native to North America. The third, *Gillia atillis*, is an introduced non-indigenous species of snail that is extending its range in North American fresh waters. This species is unlikely to have any impacts on operation of the BVPS. No state or Federal threatened or endangered macroinvertebrate species were collected during 2006.

In May 2006 samples, oligochaetes accounted for the highest mean density of macroinvertebrates and chironomids had the second highest (492/m^2 or 63 percent of the total density and 260/m^2 or 33 percent, respectively) (Table 5.4). Mollusks had a mean density of only 3/m^2.

In September 2006 samples, oligochaetes accounted for the highest mean density of macroinvertebrates and chironomids had the second highest (908/m^2 or 68 percent of the total density and 265/m^2 or 20 percent, respectively) (Table 5.4). Mollusks had the third highest mean density in September 2006 (148/m^2 or 11 percent) while the "others" category had the fourth highest mean density (14/m^2 or 1 percent).

In May, the highest density of macroinvertebrates (1,605 organisms/m^2) occurred at Station 2B3. In September, the highest density of macroinvertebrates occurred at Station 2B3 (3,240/m^2). In both May and September, the lowest mean density of organisms occurred at Station 1 (143/m^2 and 229/m^2, respectively).

For a comparison of the control to non-control stations, Station 1 was designated the control station, because it is always out of the influence of the BVPS discharge and Station 2B (mean density of Station 2B1, 2B2, and 2B3) was designated as the non-control station, since it is the station most regularly subjected to BVPS's discharge. Stations 3 and 2A may be under the influence of the plume under certain conditions, but it is unlikely that they are regularly influenced by BVPS.

In May, the mean density of macroinvertebrates in the non-control station was over eight (8) times higher (1,242/m^2) than that of the control station (143/m^2) in May (Table 5.5). The density of chironomids was about 15 times higher at the non-control station (430/m^2) than at the control station (29/m^2). The density of oligochaetes was about 10 times higher at the non-control station (764/m^2) than at the control station (71/m^2). Mollusks were present at equal densities at the control and non-control stations (43/m^2). Other taxa were only present at the non-control stations. Overall the differences probably reflect the natural differences in substrate and natural heterogeneous distributions of these organisms between the stations rather than project-related impacts.

In September, the density of macroinvertebrates present at the non-control (2,199/m^2) was about 10 times greater than at the control station (229/m^2). The density of macroinvertebrates in both the control and non-control stations was higher in September than in May. The densities of both oligochaetes and chironomids were about 11 times higher at the non-control than the control stations. The density of mollusks was about four times higher in the non-control station

($176/m^2$) than in the control ($43/m^2$). Other taxa were present only in the non control stations. As in May, the differences observed between Station 1 (control) and Station 2B (non-control) were probably related to observed differences in habitat at each station. Differences were within the expected range of variation for natural populations of macroinvertebrates.

Indices that describe the relative diversity, evenness, and richness of the macroinvertebrate population structure among stations and between control and non-control sites were calculated. A higher Shannon-Weiner diversity index indicates a relatively better structured assemblage of organisms, while a lower index generally indicates a low quality or stressed community. Evenness is an index that estimates the relative contribution of each taxon to the community assemblage, the closer to 1.00, the healthier the community. The community richness is another estimate of the quality of the macroinvertebrate community with a higher richness number indicating a healthier community.

The Shannon-Weiner diversity indices in May 2006 collections ranged from 0.42 at Station 3 to 0.91 at Station 2B2 (Table 5.6). In May evenness ranged from 0.50 at Station 3 to 0.90 at Station 1. Richness was greatest at Station 1 (2.61) and lowest at Station 3 (0.81). The diversity of the macroinvertebrate community in September was generally comparable to that in May. Diversity ranged from 0.40 at Station 1 to 0.83 at Station 2A. Evenness was also comparable in September to May and ranged from 0.43 at Station 2B2 to 0.87 at Station 2A. Richness was greatest at Stations 2A and 2B3 (2.77) and lowest at Station 1 (0.72).

In May, the number of taxa, diversity, evenness and richness indices were somewhat lower in the control station (Station 1) and in the non-control stations (2B1, 2B2, 2B3) (Table 5.6). In September the same pattern held true. These differences were not apparent in previous years and were likely due to natural annual variations in the local populations at these locations. No impacts of the BVPS on the benthic community, as measured by differences between control and non-control zones, were evident in either May or September.

Substrate was probably the most important factor controlling the distribution and abundance of the benthic macroinvertebrates in the Ohio River near BVPS. Soft, mucky substrates that existed along the shoreline are conducive to oligochaete, chironomid, and mollusk habitation and limit species of macroinvertebrates that require a more stable bottom.

The density of macroinvertebrates in May and September 2006 fell within the range of densities of macroinvertebrates collected at BVPS in previous years (Table 5.7). The introduction of zebra mussels and *Corbicula* into the Ohio River may impact the benthic community structure. ***However, the community structure has changed little since pre-operational years, and the available evidence does not indicate that BVPS operations have affected the benthic community of the Ohio River).***

5.4.2 Fish Sampling Program

In 2006, 281 fishes representing 25 taxa were collected (i.e., handled) during BVPS surveys by electrofishing and seining (Table 5.8). All taxa collected in 2006 were previously encountered at BVPS. The most common species in the 2005 BVPS surveys, collected by electrofishing and seining combined, were shorthead redhorse sucker (18.9% of the total catch), followed by gizzard shad (12.5 %), black buffalo (11.7%), golden redhorse sucker (9.6%), sauger (7.8%), emerald shiner (6.1%) and white bass (6.1%). The remaining 18 species combined accounted for 27.3% of the total handled catch. The most frequently observed but not handled fish in 2006 were long nose gar (Table 5.15). Game fishes collected during 2006 included channel catfish, flathead catfish, white bass, black crappie, bluegill, smallmouth bass, sauger, walleye, and spotted bass. Game fishes represented 27.8 % of the total handled catch, 13.9% of which were white bass and sauger.

A total of 258 fish, representing 22 taxa, was collected by electrofishing in 2006 (Table 5.9). Shorthead redhorse suckers and gizzard shad accounted for the largest portion of the 2006 electrofishing catch (20.5% and 13.6%, respectively) followed by black buffalo (12.8%), golden redhorse sucker (10.5%), sauger (8.5%), white bass (6.7%) and smallmouth bass (6.2%). No other species collected contributed to greater than five percent of the total catch. Fish observed and not collected in the 2006 electrofishing study are presented in Table 5.15.

A total of 23 fish representing 6 taxa was collected by seining in 2006 (Table 5.10). The most abundant taxa collected was emerald shiner (73.9% of the total catch) followed by northern hogsucker (8.7%). The only game species collected by seining were spotted bass and bluegill.

A total of 134 fish representing 15 species was captured during the May 2006 sample event (Table 5.11). A total of 117 fish representing 113 species was collected during electrofishing and 17 fish from two species was collected during seine netting. Golden redhorse sucker (16.2% of the total catch), sauger (14.5%), shorthead redhorse sucker (13.7%) and white bass (12.8%) were the most common species boated during the electrofishing effort. Sauger, white bass, walleye, smallmouth bass, spotted bass, black crappie and a white bass x striped bass hybrid were the game species collected in May. Sixteen emerald shiners and one northern hogsucker were the only fish collected during the seining effort.

A total of 30 fish representing 9 species was captured during the July 2006 sample event (Table 5.12). A total of 28 fish representing 8 species was collected during electrofishing efforts. Shorthead redhorse sucker (42.9% of the total catch), golden redhorse sucker (14.3%), gizzard shad (10.7%) and smallmouth bass (10.7%) were the most common species boated during the electrofishing effort. Smallmouth bass and black crappie were the only game species collected during the July electrofishing study (Table 5.15). One longnose gar and one northern hogsucker were the only fish collected by the seines.

During the September sample event, 47 fish representing 15 taxa were collected (Table 5.13). A total of 45 fish representing 14 species was collected during electrofishing in September. Shorthead redhorse sucker (31.1% of the total catch), gizzard shad (11.1%) and sauger (11.1%) were the most abundant species collected electrofishing followed by longnose gar (8.9%), black buffalo (6.7%), and black common carp (6.7%). Smallmouth bass, spotted bass, sauger, white bass, and bluegill comprised the game species collected during electrofishing efforts in September. Two fish, an emerald shiner and a spotted bass were collected during the seining effort.

During the November sample event, 70 fish representing 15 taxa were captured (Table 5.14). A total of 68 fish representing 13 species was collected during electrofishing and 2 fish representing 2 species were collected during seine netting. Black buffalo and gizzard shad (each representing 26.5% of the total catch) were the most abundant species collected by electrofishing followed by shorthead redhorse sucker (16.2%), quillback (8.8%), freshwater drum (5.9%), and mooneye (4.4%). Game species collected by electrofishing included walleye, white bass, and channel catfish. Fish observed and not collected in the electrofishing study are presented in Table 5.15. Two fish, a bluegill and a mimic shiner were collected during the seining efforts in November.

Electrofishing catch rates are presented in Tables 5.16, 5.17, and 5.18 for fish that were boated and handled during the 2004 through 2006 surveys by season (FENOC 2005 and 2006). In 2006, the annual catch rate was 1.60 fish per minute. The greatest catch rate in 2006 occurred in May (spring) (2.85 fish/ electrofishing minute). Redhorse sucker species, white bass and sauger contributed to this total. The lowest catch rate occurred in July (summer) with a rate of 0.70 fish/ electrofishing minute. The annual catch rates were consistent over the three years ranging from a high of 1.73 fish per minute in 2005 to 1.27 in 2004. In 2004 the lowest catch rate was in the fall whereas in 2005 and 2006 the lowest catch rate was during the summer survey

The results of the electrofishing sampling effort (Table 5.9) did not indicate any major differences in species composition between the control station (1) and the non-control Stations 2A, 2B, and 3. A greater number of fish representing more species was captured at non-control stations than control stations. This was most likely due to the extra effort expended at non-control stations versus control stations (i.e., there are three non-control stations and only one control station). In 2006, (Table 5.10) few individuals and species were collected by seines at both control and non-control stations. The lower numbers at both locations than in previous years could be attributed to river conditions at the time of sampling (generally during higher than normal flow) rather than to any impacts attributable to BVPS operation.

In 2006, species composition remained comparable among stations. Common taxa collected in the 2006 surveys by all methods included gizzard shad, redhorse sucker species, black buffalo, sauger, smallmouth bass, and walleye. Little difference in the species composition of the catch was observed between the control (1) and non-control stations (2A, 2B and 3). Habitat preference and availability were probably the most important factors affecting where and when different species of fish are collected.

The results of the 2006 fish surveys indicated that there is a normal community structure in the Ohio River in the vicinity of BVPS based on species composition and relative abundance of fish observed during the surveys. Benthivores (bottom feeders including suckers and buffalo) were collected in the highest numbers. Forage species, although common were collected in lower numbers than in recent years. Variations in annual catch were probably attributable to normal fluctuations in the population size of the forage species and the predator populations that rely on them. Forage species, such as gizzard shad and emerald shiner with high reproductive potentials, frequently respond to changes in natural environmental factors (competition, food availability, cover, and water quality) with large fluctuations in population size, which could be the reason for the lower numbers of these species observed in 2006. This, in turn, influences their appearance in the sample populations during annual surveys. Spawning/rearing success due to abiotic factors is usually the determining factor of the size and composition of a fish community. In addition, differences in electrofishing catch rate can be attributed to environmental conditions that prevail during sampling efforts. High water, increased turbidity, and swift currents that occur during electrofishing efforts in some years can decrease the collection efficiency of this gear.

5.4.3 Corbicula Monitoring Program

In 2006, six *Corbicula* (none alive) were collected from the Unit 1 cooling tower basin during monthly reservoir sampling. No *Corbicula* were collected in the scraping samples. The largest *Corbicula* collected was retained in a sieve with a 6.30-9.49 mm length size range (Table 5.19 and Figure 5.5). The greatest numbers of *Corbicula* were collected in August (four individuals). The mean density of *Corbicula* in Unit 1 in 2006 was $32/m^2$. *Corbicula* were only collected in April, July, and August.

In 2006, 53 *Corbicula* (43.4 percent alive) were collected from the Unit 2 cooling tower reservoir during monthly sampling. The largest live *Corbicula* collected was within the 4.74-6.29 mm length size range (Table 5.20 and Figure 5.6). Individuals were collected in May through July and in October and November. The mean density of *Corbicula* in Unit 2 in 2006 was $291/m^2$. The greatest number of *Corbicula* (31 individuals) were collected in July.

In 2006, BVPS continued its *Corbicula* control program (Year 15), which included the use of a molluscicide (CT-1) to prevent the proliferation of *Corbicula* within BVPS. BVPS was granted permission by the Pennsylvania Department of Environmental Protection to use CT-1 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 and 1995, the CT-1 applications targeted the internal water systems; therefore, the CT-1 concentrations in the cooling towers were reduced during CT-1 applications. Consequently, adult and juvenile *Corbicula* in the cooling towers often survived the CT-1 applications. Reservoir sediment samples taken after CT-1 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 collected in Units 1 and 2 Cooling Towers during 2006 demonstrated that *Corbicula* were entering and colonizing the reservoirs. Overall, densities in Unit 1 were somewhat less than those in 2005 and in Unit 2 densities were comparable to in 2005. 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.

5.4.4 *Corbicula* Juvenile Monitoring Program

Figure 5.7 presents the abundance and size distribution data for samples collected in the Ohio River near the intake structure by petite Ponar in 2006. One individual was collected during May, July and September, while no *Corbicula* were collected in November. They were generally small, which indicated that they were spawned in 2005. The number of individuals collected was consistent with the mean of the prior three years (eight in 2003, two in 2004, and 17 in 2005).

A spring/early-summer spawning period typically occurs in the Ohio River near BVPS each year when preferred spawning temperatures (60-65° F) are reached (Figure 5.8). The offspring from this spawning event generally begin appearing in the sample collections in May. The settled clams generally increase in size throughout the year. ***The overall low numbers of live Corbicula collected in the sample collected outside the intake and cooling towers in 2006, compared to levels in the 1980's, likely reflects a natural decrease in the density of Corbicula in the Ohio River near BVPS.***

5.4.5 Zebra Mussel Monitoring Program

Zebra mussels (*Dreissena polymorpha*) are exotic freshwater mollusks that have ventrally flattened shells 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, becoming increasingly abundant in the lower, middle, and upper Ohio River. They use strong adhesive byssal threads, collectively referred to as the 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 pump samples (Figures 5.9 and 5.10) and substrate samples (Figure 5.11 and 5.12) in 2006. Zebra mussel veliger pump samples were collected from April through October 2006 (Figures 5.9 and 5.10). Veligers were collected at all of the six sites that were sampled in 2006. Densities of veligers generally peaked in late June, although they were present in relatively high densities at some sample sites in August and September. The greatest density of veligers was present in the sample collected from the splash pool in late-June (85,000/m^3). Veligers were first present in samples collected in April. Veligers were present in all months sampled except May and October. Overall, veliger densities were much higher than 2005 and 2004 but comparable in magnitude to 2003. Whether the higher densities reflect a trend towards an overall resurgence in numbers of veligers in the Ohio River or due to annual variability in uncertain.

In 2006, settled zebra mussels were collected in scrape samples at the barge slip, the intake structure and the Unit 2 Cooling Water Reservoir. (Figures 5.11 and 5.12). The highest density of mussels was present in the sample collected at the barge slip (6 mussels/m^2). The mussels collected at each of the sites included individuals that were capable of reproducing. The density of collected adult zebra mussels was consistent with past years.

Overall, both the number of observations and densities of settled mussels were similar in 2006, 2005, 2004 and 2003. The density of veligers in 2006 was much greater than in 2005 and 2004, but was comparable to 2003. 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 is resurging or only yearly fluctuations are present 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 conduced.***

6.0 ZEBRA MUSSEL AND *CORBICULA* CONTROL ACTIVITIES

In 2006, BVPS continued its *Corbicula* and zebra mussel control program (thirteenth year), which included the use of a molluscicide (CT-1) to prevent the proliferation of *Corbicula* within BVPS. BVPS was granted permission by the Pennsylvania Department of Environmental Protection to use CT-1 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 2005, the CT-1 or 2 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 2 applications. Consequently, adult and juvenile *Corbicula* in the cooling towers often survived the applications. Reservoir sediment samples taken after CT-1 or 2 applications represented mortality of *Corbicula* in the cooling tower only and do not reflect mortality in BVPS internal water systems.

In addition to clamicide treatments, proactive 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.

7.0 REFERENCES

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7.2

SCIENTIFIC AND COMMON NAME[1] OF FISH COLLECTED IN THE NEW CUMBERLAND POOL OF THE OHIO RIVER, 1970 THROUGH 2006 BVPS

[1]Nomenclature follows Robins, et al. (1991)

Family and Scientific Name	Common Name
Lepisosteidae (gars)	
Lepisosteus osseus	Longnose gar
Hiodontidae (mooneyes)	
Hiodon alosoides	Goldeye
H. tergisus	Mooneye
Clupeidae (herrings)	
Alosa chrysochloris	Skipjack herring
A. pseudoharengus	Alewife
Dorosoma cepedianum	Gizzard shad
Cyprinidae (carps and minnows)	
Campostoma anomalum	Central stoneroller
Carassius auratus	Goldfish
Ctenopharyngodon idella	Grass carp
Notropis spilopterus	Spotfin shiner
Cyprinus carpio	Common carp
C. carpio x C. auratus	Carp-goldfish hybrid
Luxilus chrysocephalus	Striped shiner
Macrhybopsis storeriana	Silver chub
Nocomis micropogon	River chub
Notemigonus crysoleucas	Golden shiner
Notropis atherinoides	Emerald shiner
N. buccatus	Silverjaw minnow
N. hudsonius	Spottail shiner
N. rubellus	Rosyface shiner
N. stramineus	Sand shiner
N. volucellus	Mimic shiner
Pimephales notatus	Bluntnose minnow
P. promelas	Fathead minnow
Rhinichthys atratulus	Blacknose dace
Semotilus atromaculatus	Creek chub
Catostomidae (suckers)	
Carpiodes carpio	River carpsucker

Family and Scientific Name	Common Name
C. cyprinus	Quillback
C. velifer	Highfin carpsucker
Catostomus commersonii	White sucker
Hypentelium nigricans	Northern hogsucker
Ictiobus bubalus	Smallmouth buffalo
I. niger	Black buffalo
Minytrema melanops	Spotted sucker
Moxostoma anisurum	Silver redhorse
M. carinatum	River redhorse
M. duquesnei	Black redhorse
M. erythrurum	Golden redhorse
M. macrolepidotum	Shorthead redhorse
Ictaluridae (bullhead catfishes)	
Ameiurus catus	White catfish
A. furcatus	Blue catfish
A. melas	Black bullhead
A. natalis	Yellow bullhead
A. nebulosus	Brown bullhead
Ictalurus punctatus	Channel catfish
Noturus flavus	Stonecat
Pylodictis olivaris	Flathead catfish
Esocidae (pikes)	
Esox lucius	Northern pike
E. masquinongy	Muskellunge
E. lucius x E. masquinongy	Tiger muskellunge
Salmonidae (trouts)	
Oncorhynchus mykiss	Rainbow trout
Percopsidae (trout-perches)	
Percopsis omiscomaycus	Trout-perch
Cyprinodontidae (killifishes)	
Fundulus diaphanus	Banded killifish
Atherinidae (silversides)	
Labidesthes sicculus	Brook silverside
Percichthyidae (temperate basses)	
Morone chrysops	White bass
M. saxatilis	Striped bass
M. saxatilis x M. chrysops	Striped bass hybrid
Centrarchidae (sunfishes)	
Ambloplites rupestris	Rock bass
Lepomis cyanellus	Green sunfish
L. gibbosus	Pumpkinseed

Family and Scientific Name	**Common Name**
L. macrochirus	Bluegill
L. microlophus	Redear sunfish
L. gibbosus x L. microlophus	Pumpkinseed-redear sunfish hybrid
Micropterus dolomieu	Smallmouth bass
M. punctulatus	Spotted bass
M. salmoides	Largemouth bass
Pomoxis annularis	White crappie
P. nigromaculatus	Black crappiePercidae (perches)
Etheostoma blennioides	Greenside darter
E. nigrum	Johnny darter
E. zonale	Banded darter
Perca flavescens	Yellow perch
Percina caprodes	Logperch
P. copelandi	Channel darter
Sander canadense	Sauger
S. vitreum	Walleye
S. canadense x S. vitreum	Saugeye
Sciaenidae (drums)	
Aplodinotus grunniens	Freshwater drum

TABLES

TABLE 5.1

BEAVER VALLEY POWER STATION (BVPS)
SAMPLING DATES FOR 2006

Study	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Benthic Macroinvertebrate					23				25		2	
Fish					23		19		25		2	
Corbicula and Zebra Mussel				12	23	22	19	17	25	18	2	
Corbicula CT Density												
Zebra Mussel Veliger				12	23	22	19	17	25	18		

TABLE 5.2

SYSTEMATIC LIST OF MACROINVERTEBRATES COLLECTED FROM 1973 THROUGH 2006 IN THE OHIO RIVER NEAR BVPS

Taxa	Collected in Previous Years	2006	New in 2006
Porifera			
Spongilla fragilis	X		
Cnidaria			
Hydrozoa			
Clavidae			
Cordylophora lacustris	X		
Hydridae			
Craspedacusta sowerbii	X		
Hydra sp.	X		
Platyhelminthes			
Tricladida	X		
Rhabdocoela	X		
Nemertea	X		
Nematoda	X		
Entoprocta			
Urnatella gracilis	X		
Ectoprocta			
Fredericella sp.	X		
Paludicella articulata	X		
Pectinatella sp.	X		
Plumatella sp.	X		
Annelida			
Oligochaeta	X		
Aeolosomatidae	X		
Tubificida	X		
Enchytraeidae	X	X	
Naididae	X	X	
Allonais pectinata	X		
Amphichaeta leydigi	X		
Amphichaeta sp.	X		
Arcteonais lomondi	X	X	
Aulophorus sp.	X		
Chaetogaster diaphanus	X		
C. diastrophus	X		
Dero digitata	X		
Dero flabelliger	X		
D. nivea	X		
Dero sp.	X		
Nais barbata	X		
N. behningi	X		

TABLE 5.2 (continued)

Taxa	Collected in Previous Years	2006	New in 2006
N. bretscheri	X		
N. communis	X	X	
N. elinguis	X		
N. pardalis	X		
N. pseudobtusa	X		
N. simplex	X		
N. variabilis	X	X	
Nais sp.	X		
Ophidonais serpentina	X		
Paranais frici	X	X	
Paranais litoralis	X		
Paranais sp.	X		
Piguetiella michiganensis	X		
Pristina idrensis	X		
Pristina longisoma	X		
Pristina longiseta	X		
P. osborni	X	X	
P. sima	X		
Pristina sp.	X		
Pristinella sp.	X		
Pristinella jenkinae	X	X	
Pristinella idrensis	X		
Pristinella osborni	X	X	
Ripistes parasita	X		
Slavina appendiculata	X		
Specaria josinae	X		
Stephensoniana trivandrana	X		
Stylaria fossularis	X		
S. lacustris	X		
Uncinais uncinata	X		
Vejdovskyella comata	X		
Vejdovskyella intermedia	X		
Vejdovskyella sp.	X		
Tubificidae	X		
Aulodrilus limnobius	X		
A. pigueti	X	X	
A. pluriseta	X		
Aulodrilus sp.	X		
Bothrioneurum vejdovskyanum	X		
Branchiura sowerbyi	X	X	
Ilyodrilus templetoni	X		
Limnodrilus cervix	X	X	
L. cervix (variant)	X		
L. claparedianus	X		
L. hoffmeisteri	X	X	
L. maumeensis	X	X	
L. profundicla	X	X	
L. spiralis	X		
L. udekemianus	X		

TABLE 5.2 (continued)

Taxa	Collected in Previous Years	2006	New in 2006
Limnodrilus sp.	X		
P. m. multisetosus	X		
Potamothrix moldaviensis	X		
Potamothrix sp.			
P. vejdovskyi	X	X	
Psammoryctides curvisetosus	X		
Tubifex tubifex	X		
Unidentified immature forms:	X		
with hair chaetae	X	X	
without hair chaetae	X	X	
Lumbriculidae	X		
Hirudinae	X		
Glossiphoniidae	X		
Helobdella elongate	X		
H. stagnalis	X		
Helobdella sp.	X		
Erpobdellidae			
Erpobdella sp.	X		
Mooreobdella microstoma	X		
Haplotaxidae			
Stylodrilus heringianus	X		
Lumbricina	X		
Lumbricidae	X		
Arthropoda			
Acarina	X		
Ostracoda	X		
Isopoda			
Asellus sp.	X		
Amphipoda			
Talitridae			
Hyalella azteca	X		
Gammaridae			
Crangonyx pseudogracilis	X		
Crangonyx sp.	X		
Gammarus fasciatus	X		
Gammarus sp.	X		
Pontoporeiidae			
Monoporeia affinis	X		
Decapoda	X		
Collembola	X		

TABLE 5.2 (continued)

Taxa	Collected in Previous Years	2006	New in 2006
Ephemeroptera	X		
Heptageniidae	X		
Stenacron sp.	X		
Stenonema sp.	X		
Ephemeridae			
Ephemera sp.	X		
Hexagenia sp.	X	X	
Ephron sp.	X		
Baetidae	X		
Baetis sp.			
Caenidae			
Caenis sp.	X		
Serattella sp.	X		
Potamanthidae			
Potamanthus sp.			
Tricorythidae			
Tricorythodes sp.	X		
Megaloptera			
Sialis sp.	X		
Odonata			
Gomphidae			
Argia sp.	X		
Dromogomphus spoliatus	X		
Dromogomphus sp.	X		
Gomphus sp.	X		
Libellulidae			
Libellula sp.	X		
Plecoptera	X		
Trichoptera	X		
Hydropsychidae	X		
Cheumatopsyche sp.	X		
Hydropsyche sp.	X		
Parapsyche sp.	X		
Psychomyiidae			
Psychomyia sp.			
Hydroptilidae			
Hydroptila sp.	X		
Orthotrichia sp.			
Oxyethira sp.	X		
Leptoceridae			
Ceraclea sp.	X		
Leptocerus sp.	X		
Oecetis sp.	X	X	
Polycentropodidae			
Cymellus sp	X		
Polycentropus sp.	X		

TABLE 5.2 (continued)

Taxa	Collected in Previous Years	2006	New in 2006
Coleoptera	X		
Hydrophilidae	X		
Elmidae			
Ancyronyx variegatus	X		
Dubiraphia sp.	X		
Helichus sp.	X		
Optioserus sp.	X		
Stenelmis sp.	X		
Psephenidae	X		
Diptera			
Unidentified Diptera	X		
Probezzia	X	X	
Psychodidae	X		
Pericoma sp.	X		
Psychoda sp.	X		
Telmatoscopus sp.	X		
Unidentified Psychodidae pupae	X		
Chaoboridae			
Chaoborus sp.	X		
Simuliidae			
Similium sp.	X		
Chironomidae	X		
Chironominae	X		
Tanytarsini pupa	X		
Chironominae pupa	X		
Axarus sp.	X		
Chironomus sp.	X	X	
Cladopelma sp.	X		
Cladotanytarsus sp.	X		
Cryptochironomus sp.	X	X	
Dicrotendipes nervosus	X		
Dicrotendipes sp.	X		
Glyptotendipes sp.	X	X	
Harnischia sp.	X		
Microchironomus sp.	X		
Micropsectra sp.	X		
Microtendipes sp.	X		
Parachironomus sp.	X		
Paracladopelma sp.	X		
Paratanytarsus sp.	X		
Paratendipes albimanus	X		
Phaenopsectra sp.	X	X	
Polypedilum (s.s.) *convictum* type	X		
P. (s.s.) *simulans* type	X	X	
Polypedilum sp.	X		
Rheotanytarsus sp.	X		
Stenochironomus sp.	X		
Stictochironomus sp.	X		
Tanytarsus coffmani	X		

TABLE 5.2 (continued)

Taxa	Collected in Previous Years	2006	New in 2006
Tanytarsus sp.	X	X	
Tribelos sp.	X		
Xenochironomus sp.	X		
Tanypodinae	X		
Tanypodinae pupae	X		
Ablabesmyia sp.	X	X	
Clinotanypus sp.	X		
Coelotanypus scapularis	X		
Coelotanypus sp.	X	X	
Djalmabatista pulcher	X		
Djalmabatista sp.	X		
Procladius sp.	X	X	
Tanypus sp.	X		
Thienemannimyia group	X		
Zavrelimyia sp.	X		
Orthocladiinae	X		
Orthocladiinae pupae	X		
Cricotopus bicinctus	X		
C. (s.s.) *trifascia*	X		
Cricotopus (Isocladius)- sylvestris Group	X		
C. (Isocladius) sp.	X		
Cricotopus (s.s.) sp.	X	X	
Eukiefferiella sp.	X		
Hydrobaenus sp.	X		
Limnophyes sp.	X		
Nanocladius (s.s.) *distinctus*	X		
Nanocladius sp.	X		
Orthocladius sp.	X		
Parametriocnemus sp.	X		
Paraphaenocladius sp.	X		
Psectrocladius sp.	X		
Psectrotanypus sp.			
Pseudorthocladius sp.	X		
Pseudosmittia sp.	X		
Smittia sp.	X		
Theinemannimyia sp.	X		
Diamesinae			
Diamesa sp.	X		
Potthastia sp.	X		
Ceratopogonidae	X		
Bezzia sp.	X		
Culicoides sp.	X	X	
Dolichopodidae	X		
Empididae	X		
Clinocera sp.	X		
Wiedemannia sp.	X		
Ephydridae	X		
Muscidae	X		

TABLE 5.2 (continued)

Taxa	Collected in Previous Years	2006	New in 2006
Limnphora sp.			
Rhagionidae	X		
Tipulidae	X		
Stratiomyidae	X		
Syrphidae	X		
Lepidoptera	X		
Hydrachnidia	X		
Mollusca			
Gastropoda	X		
Hydrobiidae	X		
Amnicolinae			
Amnicola sp.	X		
Aminicola binneyana	X	X	
Amnicola limosa	X	X	
Stagnicola elodes	X	X	X
Physacea	X		
Pleuroceridae			
Pleurocera acuta	X	X	X
Goniobasis sp	X		
Physidae	X		
Physa sp.	X		
Physa ancillaria	X		
Physa integm	X		
Ancylidae	X		
Ferrissia sp.	X		
Planorbidae			
Gillia atilis	X	X	X
Valvatidae	X		
Valvata perdepressa	X		
Valvata piscinalis	X		
Valvata sincera sincera	X		
Valvata sp.	X		
Pelecypoda	X		
Sphaeriacea	X		
Corbiculidae			
Corbicula fluminea	X		
Corbicula sp.	X	X	
Sphaeriidae	X		
Pisidium ventricosum	X		
Pisidium sp.	X	X	
Sphaerium sp.	X		
Unidentified immature Sphaeriidae	X		
Dreissenidae			
Dreissena polymorpha	X		
Unionidae	X		
Anodonta grandis	X		

TABLE 5.2 (continued)

Taxa	Collected in Previous Years2006	New in 2006
Anodonta (immature)	X	
Elliptio sp.	X	
Quadrula pustulosa	X	
Unidentified immature Unionidae	X	

TABLE 5.3

BENTHIC MACROINVERTEBRATE COUNTS FOR TRIPLICATE SAMPLES
TAKEN AT EACH SAMPLE STATION FOR MAY AND SEPTEMBER 2006

Scientific name	May Location						May	Sept Location						Sept	2006
	1	2A	2B1	2B2	2B3	3	Total	1	2A	2B1	2B2	2B3	3	Total	Total
Ablabesmyia sp.	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1
Amnicola sp.	0	0	0	2	0	0	2	0	0	0	0	0	0	0	2
Amnicola limosa	1	0	0	0	0	0	1	0	1	0	0	2	2	5	6
Arcteonais lomondi	0	0	2	3	2	0	7	0	0	0	0	0	0	0	7
Autodrilus pigueti	0	0	0	0	1	0	1	0	0	0	1	0	0	1	2
Branchiura sowerbyi	0	0	1	0	0	0	1	0	0	1	1	2	0	4	5
Chironomus sp.	0	0	1	17	40	0	58	0	1	0	0	3	0	4	62
Coelotanypus sp.	0	0	0	0	0	0	0	0	0	0	4	1	6	11	11
Corbicula sp.	2	0	3	1	0	1	7	3	5	6	0	0	3	17	24
Cricotopus (s.s.) sp.	0	12	0	1	0	0	13	0	1	0	0	0	0	1	14
Cryptochironomus sp.	0	0	6	4	2	0	12	0	0	0	0	0	0	0	12
Culicoides sp.	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1
Enchytraeidae	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1
Gillia atilis	0	0	0	0	0	0	0	0	0	4	1	0	0	5	5
Glyptotendipes	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1
Hexagenia sp.	0	0	0	0	0	0	0	0	0	0	3	0	1	4	4
Immature tubificid without	4	0	37	9	30	30	110	10	2	22	121	129	33	317	427
Limnodrilus cervix	0	0	0	0	12	0	12	0	0	0	0	4	1	5	17
Limnodrilus hoffmeisteri	0	0	5	4	4	0	13	0	0	2	3	0	11	16	29
Limnodrilus maumeensis	0	0	0	0	2	0	2	0	0	0	0	2	0	2	4
Limnodrilus profundicola	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2
Lumbriculidae	0	0	1	0	1	0	2	0	0	0	0	0	0	0	2
Naididae	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Nais communis	0	4	36	0	0	3	43	0	0	2	0	0	0	2	45
Nais variabilis	0	0	0	0	0	0	0	0	0	0	0	5	0	5	5
Ocetis sp.	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Paranais frici	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1
Phaenopsectra sp.	0	0	0	1	0	1	2	0	0	0	0	0	0	0	2
Pleurocera acuta	0	0	0	0	0	0	0	0	5	18	2	4	2	31	31
Pisidium sp.	0	0	3	0	0	0	3	0	1	0	0	0	0	1	4
Polypedilum sp.	1	1	2	3	3	0	10	3	0	15	3	63	0	84	94
Potamothrix vejdovskyi	1	0	1	0	0	0	2	0	0	0	0	2	0	2	4
Pristina osborni	0	0	0	0	0	0	0	0	0	1	9	4	1	15	15
Pristinella jenkinae	0	0	0	1	8	3	12	0	0	0	5	2	0	7	19
Probezzia sp.	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Procladius sp.	0	0	0	0	5	0	5	0	0	0	7	0	0	7	12
Stagnicola elodes	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3
Stylaria lacustris	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Tanytarsus sp.	1	1	1	2	1	0	6	0	1	1	0	1	0	3	9
Xenochironomus	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Monthly Total	10	19	99	49	112	40	329	16	18	73	161	226	65	559	888

TABLE 5.4

MEAN NUMBER OF MACROINVERTEBRATES (NUMBER/M^2) AND PERCENT COMPOSITION OF OLIGOCHAETA, CHIRONOMIDAE, MOLLUSCA, AND OTHER ORGANISMS, 2006 BVPS

May	Station													
	1 (Control)		2A		2B1 (Non-control)		2B2 (Non-control)		2B3 (Non-control)		3		Total Mean	
	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%
Oligochaeta	71	50	57	21	1190	84	244	35	860	54	530	92	492	63
Chironomidae	29	20	215	79	143	10	415	59	731	46	29	5	260	33
Mollusca	43	30	0	0	86	6	43	6	0	0	14	2	31	4
Others	0	0	0	0	0	0	0	0	14	1	0	0	3	0
Total	143	100	272	100	1419	100	702	100	1605	100	573	100	786	100

September	Station													
	1 (Control)		2A		2B1 (Non-control)		2B2 (Non-control)		2B3 (Non-control)		3		Total Mean	
	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%	#/m^2	%
Oligochaeta	143	62	29	11	401	38	2007	87	2179	67	688	74	908	68
Chironomidae	43	19	57	22	230	22	201	9	975	30	86	9	265	20
Mollusca	43	19	172	67	401	38	43	2	86	3	143	15	148	11
Others	0	0	0	0	14	1	57	2	0	0	14	2	14	1
Total	229	100	258	100	1046	100	2308	100	3240	100	931	100	1335	100

TABLE 5.5

MEAN NUMBER OF MACROINVERTEBRATES (NUMBER/M^2) AND PERCENT COMPOSITION OF OLIGOCHAETA, CHIRONOMIDAE, MOLLUSCA, AND OTHER ORGANISMS FOR THE CONTROL STATION (1) AND THE AVERAGE FOR NON-CONTROL STATIONS (2B1, 2B2, AND 2B3), 2006 BVPS

May

Taxa	Control Station (Mean)		Non-Control Station (Mean)	
	#/m^2	%	#/m^2	%
Oligochaeta	71	50	764	62
Chironomidae	29	20	430	35
Mollusca	43	30	43	3
Others	0	0	5	0
TOTAL	143	100	1242	100

September

Taxa	Control Station (Mean)		Non-Control Station (Mean)	
	#/m^2	%	#/m^2	%
Oligochaeta	143	62	1529	70
Chironomidae	43	19	469	21
Mollusca	43	19	177	8
Others	0	0	24	1
TOTAL	229	100	2199	100

TABLE 5.6

SHANNON-WEINER DIVERSITY, EVENNESS AND RICHNESS INDICES FOR BENTHIC MACROINVERTEBRATES COLLECTED IN THE OHIO RIVER, 2006

	Station					
May	1	2A	2B1	2B2	2B3	3
No. of Taxa	6	5	13	13	14	7
Shannon-Weiner Index	0.70	0.47	0.72	0.91	0.82	0.42
Evenness	0.90	0.67	0.65	0.81	0.72	0.50
Richness	2.61	1.70	1.09	1.28	1.06	0.81

	Station					
September	1	2A	2B1	2B2	2B3	3
No. of Taxa	3	9	11	13	16	11
Shannon-Weiner Index	0.40	0.83	0.79	0.48	0.58	0.73
Evenness	0.84	0.87	0.76	0.43	0.48	0.70
Richness	0.72	2.77	2.33	2.36	2.77	2.40

TABLE 5.7

BENTHIC MACROINVERTEBRATE DENSITIES (NUMBER/M^2) FOR STATION 1 (CONTROL) AND STATION 2B (NON-CONTROL) DURING PREOPERATIONAL AND OPERATIONAL YEARS THROUGH 2006
BVPS

Month	Preoperational Years						Operational Years					
	1973		1974		1975		1976		1977		1978	
	1	2B	1	2B	1	2B	1	2B	1	2B	1	2B
May	248	508	1,116	2,197			927	3,660	674	848	351	126
August	99	244	143	541	1,017	1,124	851	785	591	3,474	601	1,896
Mean	173	376	630	1,369	1,017	1,124	889	2,223	633	2,161	476	1,011

Month	Operational Years											
	1979		1980		1981		1982		1983		1984	
	1	2B	1	2B	1	2B	1	2B	1	2B	1	2B
May	1,004	840	1,041	747	209	456	3,490	3,026	3,590	1,314	2,741	621
August	1,185	588										
September			1,523	448	2,185	912	2,958	3,364	4,172	4,213	1,341	828
Mean	1,095	714	1,282	598	1,197	684	3,223	3,195	3,881	2,764	2,041	725

TABLE 5.7 (Cont'd)

Month	Operational Years											
	1985		1986		1987		1988		1989		1990	
	1	2B	1	2B	1	2B	1	1	1	2B	1	2B
May	2,256	867	601	969	1,971	2,649	1,1804	1,775	3,459	2,335	15,135	5,796
September	1,024	913	849	943	2,910	2,780	1,420	1,514	1,560	4,707	5,550	1,118
Mean	1,640	890	725	956	2,440	2,714	1,612	1,645	2,510	3,274	10,343	3,457

Month	Operational Years											
	1991		1992		1993		1994		1995		1996	
	1	2B	1	2B	1	2B	1	2B	1	2B	1	2B
May	7,760	6,355	7,314	10,560	8,435	2,152	6,980	2,349	8,083	9,283	1,987	1,333
September	3,855	2,605	2,723	4,707	4,693	2,143	1,371	2,930	1,669	3,873	1,649	2,413
Mean	5,808	4,480	5,019	7,634	6,564	2,148	4,176	2,640	4,876	6,578	1,814	1,873

*Mean of 2B1, 2B2, 2B3

TABLE 5.7 (Cont'd)

Month	Operational Years							
	1997		1998		1999		2000	
	5.1 1	2B*	1	2B	1	2B*	1	2B*
May	1,411	2,520	6,980	2,349	879	1,002	2,987	2,881
September	1,944	2,774	1,371	2,930	302	402	3,092	2,742
Mean	1,678	2,647	4,176	2,640	591	702	3,040	2,812

*Mean of 2B1, 2B2, 2B3

Month	Operational Years							
	2001		2002		2003		2004	
	1	2B*	1	2B*	1	2B*	1	2B*
May	3,139	5,232	1,548	2,795	7,095	10,750	2752	4558
September			8,632	14,663	2,193	6,464	10062	7604
Mean	3,139	5,232	5,090	8,729	4,644	8,607	6407	6121

*Mean of 2B1, 2B2, 2B3

TABLE 5.7 (Cont'd)

Month	Operational Years							
	2005		2006					
	1	2B*	1	2B*	1	2B*	1	2B*
May	516	1146	143	1242				
September	4773	6435	229	2199				
Mean	2645	3791	186	1721				

*Mean of 2B1, 2B2, 2B3

TABLE 5.8

TOTAL FISH CATCH; ELECTROFISHING AND SEINE NET COMBINED DURING THE BVPS 2006 FISHERIES SURVEY

Common Name	Scientific Name	Number	Percent
Gizzard shad	*Dorosoma cepedianum*	35	12.46
Emerald shiner	*Notropis atherinoides*	17	6.05
White bass	*Morone chrysops*	17	6.05
Golden redhorse sucker	*Moxostoma erythrurum*	27	9.61
Shorthead redhorse sucker	*Moxostoma macrolepidotum*	53	18.86
Black buffalo	*Ictiobus niger*	33	11.74
Smallmouth bass	*Micropterus dolomieu*	16	5.69
Sauger	*Sander canadense*	22	7.83
Quillback	*Carpiodes cyprinus*	10	3.56
Longnose gar	*Lepisosteus osseus*	7	2.49
Freshwater drum	*Aplodinotis grunniuns*	4	1.42
Mooneye	*Hiodon tergisus*	4	1.42
Silver redhorse	*Moxostoma anisurum*	2	0.71
Channel catfish	*Ictalurus punctatus*	1	0.36
Spotted bass	*Micropterus punctulatus*	7	2.49
Northern hogsucker	*Hypentelium nigricans*	2	0.71
Walleye	*Sander vitreum*	11	3.91
Bluegill	*Lepomis macrochirus*	2	0.71
Flathead catfish	*Pylodictis olivaris*	1	0.36
Skipjack herring	*Alosa chrysochloris*	1	0.36
Common carp	*Cyprinus carpio*	4	1.42
Black crappie	*Pomoxis nigromaculatus*	2	0.71
River carpsucker	*Carpiodes carpio*	1	0.36
Mimic shiner	*Notropis volucellus*	1	0.36
Striped bass x White bass		1	0.36

Total Fish Collected in 2006 281

TABLE 5.9

COMPARISON OF CONTROL VS. NON-CONTROL ELECTROFISHING CATCHES DURING THE BVPS 2006 FISHERIES SURVEY

Common Name	Control	%	Non-control	%	Total fish	%
Black crappie	1	1.09	1	0.6	2	0.78
Gizzard shad	10	10.87	25	15.1	35	13.57
White bass	4	4.35	13	7.8	17	6.59
Golden redhorse sucker	14	15.22	13	7.8	27	10.47
Shorthead redhorse sucker	27	29.35	26	15.7	53	20.54
Black buffalo	7	7.61	26	15.7	33	12.79
Sauger	9	9.78	13	7.8	22	8.53
Quillback	3	3.26	7	4.2	10	3.88
Smallmouth bass	6	6.52	10	6.0	16	6.20
Mooneye	1	1.09	3	1.8	4	1.55
Silver redhorse	1	1.09	1	0.6	2	0.78
Channel catfish	1	1.09			1	0.39
Walleye	5	5.43	6	3.6	11	4.26
Bluegill			1	0.6	1	0.39
Flathead catfish			1	0.6	1	0.39
Longnose gar			6	3.6	6	2.33
Common carp			4	2.4	4	1.55
Striped bass x White bass			1	0.6	1	0.39
Freshwater drum	2	2.17	2	1.2	4	1.55
Spotted bass	1	1.09	5	3.0	6	2.33
River carpsucker			1	0.6	1	0.39
Skipjack herring			1	0.6	1	0.39
Electrofishing Totals	92	100.00	166	100	258	100.00

TABLE 5.10

COMPARISON OF CONTROL VS. NON-CONTROL SEINE CATCHES DURING THE BVPS 2006 FISHERIES SURVEY

Common Name	Control	%	Non-control	%	Total fish	%
Bluegill	1	5.26	0	0.00	1	4.35
Emerald shiner	13	68.42	4	100.00	17	73.91
Longnose gar	1	5.26	0	0.00	1	4.35
Mimic shiner	1	5.26	0	0.00	1	4.35
Northern hogsucker	2	10.53	0	0.00	2	8.70
Spotted bass	1	5.26	0	0.00	1	4.35
Seine Totals	19	100.00	4	100.00	23	100.00

TABLE 5.11

FISH SPECIES COLLECTED DURING THE MAY 2006 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Sample locations *						Seine		Electrofishing	
	S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Black buffalo			5	2		3	0	0.00	10	8.55
Black crappie						1	0	0.00	1	0.85
Bluegill							0	0.00	0	0.00
Carp							0	0.00	0	0.00
Channel catfish							0	0.00	0	0.00
Emerald shiner	12	4					16	94.12	0	0.00
Flathead catfish							0	0.00	0	0.00
Freshwater drum							0	0.00	0	0.00
Gizzard shad			1		5	3	0	0.00	9	7.69
Golden redhorse sucker			9	6	4		0	0.00	19	16.24
Highfin carpsucker							0	0.00	0	0.00
Longnose gar							0	0.00	0	0.00
Mimic shiner							0	0.00	0	0.00
Mooneye							0	0.00	0	0.00
Northern hog sucker	1						1	5.88	0	0.00
Quillback			2				0	0.00	2	1.71
River carpsucker							0	0.00	0	0.00
Sauger			6	2		9	0	0.00	17	14.53
Shorthead redhorse sucker			7	6	2	1	0	0.00	16	13.68
Silver redhorse							0	0.00	0	0.00
Skipjack herring						1	0	0.00	1	0.85
Smallmouth bass			5	6			0	0.00	11	9.40
Spotted bass			1	1	2	1	0	0.00	5	4.27
Striped bass x White bass				1			0	0.00	1	0.85
Walleye			5	1	2	2	0	0.00	10	8.55
White bass			4	1	3	7	0	0.00	15	12.82
Total	13	4	45	26	18	28	17	100.00	117	100.00

* Gear = (E) Fish captured by electrofishing; (S) captured by seining

TABLE 5.12

FISH SPECIES COLLECTED DURING THE JULY 2006 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Sample locations *						Seine		Electrofishing	
	S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Black buffalo					1	1	0	0.00	2	7.14
Black crappie			1				0	0.00	1	3.57
Bluegill							0	0.00	0	0.00
Carp							0	0.00	0	0.00
Channel catfish							0	0.00	0	0.00
Emerald shiner							0	0.00	0	0.00
Flathead catfish							0	0.00	0	0.00
Freshwater drum							0	0.00	0	0.00
Gizzard shad					3		0	0.00	3	10.71
Golden redhorse sucker			4				0	0.00	4	14.29
Highfin carpsucker							0	0.00	0	0.00
Longnose gar	1				2		1	50.00	2	7.14
Mimic shiner							0	0.00	0	0.00
Mooneye							0	0.00	0	0.00
Northern hog sucker	1						1	50.00	0	0.00
Quillback							0	0.00	0	0.00
River carpsucker							0	0.00	0	0.00
Sauger							0	0.00	0	0.00
Shorthead redhorse sucker			4	8			0	0.00	12	42.86
Silver redhorse			1				0	0.00	1	3.57
Skipjack herring							0	0.00	0	0.00
Smallmouth bass			1	1	1		0	0.00	3	10.71
Spotted bass							0	0.00	0	0.00
Striped bass x White bass							0	0.00	0	0.00
Walleye							0	0.00	0	0.00
White bass							0	0.00	0	0.00
Total	2	0	11	9	7	1	2	100.00	28	100.00

* Gear = (E) Fish captured by electrofishing; (S) captured by seining

TABLE 5.13

FISH SPECIES COLLECTED DURING THE SEPTEMBER 2006 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Sample locations *						Seine		Electrofishing	
	S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Black buffalo				3			0	0.00	3	6.67
Black crappie							0	0.00	0	0.00
Bluegill					1		0	0.00	1	2.22
Carp					1	2	0	0.00	3	6.67
Channel catfish							0	0.00	0	0.00
Emerald shiner	1						1	50.00	0	0.00
Flathead catfish							0	0.00	0	0.00
Freshwater drum							0	0.00	0	0.00
Gizzard shad			3	1		1	0	0.00	5	11.11
Golden redhorse sucker			1	1			0	0.00	2	4.44
Highfin carpsucker							0	0.00	0	0.00
Longnose gar				2	1	1	0	0.00	4	8.89
Mimic shiner							0	0.00	0	0.00
Mooneye					1		0	0.00	1	2.22
Northern hog sucker							0	0.00	0	0.00
Quillback			1			1	0	0.00	2	4.44
River carpsucker							0	0.00	0	0.00
Sauger			3			2	0	0.00	5	11.11
Shorthead redhorse sucker			9	3		2	0	0.00	14	31.11
Silver redhorse						1	0	0.00	1	2.22
Skipjack herring							0	0.00	0	0.00
Smallmouth bass				1	1		0	0.00	2	4.44
Spotted bass	1			1			1	50.00	1	2.22
Striped bass x White bass							0	0.00	0	0.00
Walleye							0	0.00	0	0.00
White bass						1	0	0.00	1	2.22
Total	2	0	17	12	5	11	2	100.00	45	100.00

* Gear = (E) Fish captured by electrofishing; (S) captured by seining

TABLE 5.14

FISH SPECIES COLLECTED DURING THE NOVEMBER 2006 SAMPLING OF THE OHIO RIVER IN THE VICINITY OF BVPS

Common Name	Sample locations *						Seine		Electrofishing	
	S-1	S-2	E-1	E-2A	E-2B	E-3	Total	%	Total	%
Black buffalo			2	3	8	5	0	0.00	18	26.47
Black crappie							0	0.00	0	0.00
Bluegill	1						1	50.00	0	0.00
Carp						1	0	0.00	1	1.47
Channel catfish			1				0	0.00	1	1.47
Emerald shiner							0	0.00	0	0.00
Flathead catfish					1		0	0.00	1	1.47
Freshwater drum			2	1	1		0	0.00	4	5.88
Gizzard shad			6	1	3	8	0	0.00	18	26.47
Golden redhorse sucker					2		0	0.00	2	2.94
Highfin carpsucker							0	0.00	0	0.00
Longnose gar							0	0.00	0	0.00
Mimic shiner	1						1	50.00	0	0.00
Mooneye			1	2			0	0.00	3	4.41
Northern hog sucker							0	0.00	0	0.00
Quillback					1	5	0	0.00	6	8.82
River carpsucker				1			0	0.00	1	1.47
Sauger							0	0.00	0	0.00
Shorthead redhorse sucker			7	2	2		0	0.00	11	16.18
Silver redhorse							0	0.00	0	0.00
Skipjack herring							0	0.00	0	0.00
Smallmouth bass							0	0.00	0	0.00
Spotted bass							0	0.00	0	0.00
Striped bass x White bass							0	0.00	0	0.00
Walleye					1		0	0.00	1	1.47
White bass					1		0	0.00	1	1.47
Total	2	0	19	10	20	19	2	100.00	68	100.00

TABLE 5.15

ESTIMATED NUMBER OF FISH OBSERVED * DURING ELECTROFISHING OPERATIONS, 2006

Common Name	May	July	Sept	Nov	Total
Black Buffalo	-	-	-	2	**2**
Carp	1	1	-	-	**2**
Freshwater Drum	-	-	-	2	**2**
Golden redhorse sucker	-	-	-	-	**0**
Gizzard shad	2	5	-	-	**7**
Redhorse sucker	3	3	-	-	**6**
Smallmouth bass	1	-	-	-	**1**
Longnose gar	-	9	1	-	**10**
Total	7	18	1	4	**30**

* = Not boated or handled

Table 5.16

CATCH PER UNIT EFFORT
(CPUE AS FISH/ELECTROFISHING MINUTE)
BY SEASON DURING THE BVPS 2004 FISHERIES SURVEY

Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Spring	40.7	Black buffalo	7	0.172
		Bluegill	0	0.000
		Channel catfish	6	0.147
		Common carp	1	0.025
		Emerald shiner	0	0.000
		Flathead catfish	2	0.049
		Freshwater drum	3	0.074
		Gizzard shad	4	0.098
		Golden redhorse sucker	16	0.393
		Longnose gar	1	0.025
		Mooneye	1	0.025
		Northern hogsucker	1	0.025
		Quillback	5	0.123
		Sauger	5	0.123
		Shorthead redhorse sucker	10	0.246
		Silver redhorse	3	0.074
		Smallmouth bass	1	0.025
		Striped bass hybrid	0	0.000
		Walleye	2	0.049
		White bass	2	0.049
		Season Total	70	1.720

Season	Effort (min)	Common Name	Count of species	CPUE (fish/min)
Summer	40.4	Black buffalo	7	0.1733
		Bluegill	0	0.0000
		Channel catfish	3	0.0743
		Common carp	1	0.0248
		Emerald shiner	1	0.0248
		Flathead catfish	1	0.0248
		Freshwater drum	1	0.0248
		Gizzard shad	1	0.0248
		Golden redhorse sucker	7	0.1733
		Longnose gar	0	0.0000
		Mooneye	1	0.0248
		Northern hogsucker	0	0.0000
		Quillback	2	0.0495
		Sauger	0	0.0000
		Shorthead redhorse sucker	4	0.0990
		Silver redhorse	6	0.1485
		Smallmouth bass	1	0.0248
		Striped bass hybrid	0	0.0000
		Walleye	1	0.0248
		White bass	1	0.0248
		Season Total	38	0.9406

Table 5.16 Continued

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Fall	40.70	Black Buffalo	1	0.0248
		Bluegill	0	0.0000
		Channel catfish	0	0.0000
		Common carp	1	0.0248
		Emerald shiner	0	0.0000
		Flathead catfish	0	0.0000
		Freshwater drum	4	0.0990
		Gizzard shad	2	0.0495
		Golden redhorse sucker	9	0.2228
		Longnose gar	0	0.0000
		Mooneye	0	0.0000
		Northern hogsucker	0	0.0000
		Quillback	1	0.0248
		Sauger	5	0.1238
		Shorthead redhorse sucker	1	0.0248
		Silver redhorse	1	0.0248
		Smallmouth bass	1	0.0248
		Striped bass hybrid	0	0.0000
		Walleye	4	0.0990
		White catfish	0	0.0000
		White bass	0	0.0000
		Season Total	30	0.7426
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Winter	40.40	Black Buffalo	17	0.4208
		Bluegill	0	0.0000
		Channel catfish	1	0.0248
		Common carp	0	0.0000
		Emerald shiner	0	0.0000
		Flathead catfish	0	0.0000
		Freshwater drum	3	0.0743
		Gizzard shad	6	0.1485
		Golden redhorse sucker	8	0.1980
		Longnose gar	1	0.0248
		Mooneye	4	0.0990
		Northern hogsucker	0	0.0000
		Quillback	3	0.0743
		Sauger	3	0.0743
		Shorthead redhorse sucker	8	0.1980
		Silver redhorse	2	0.0495
		Smallmouth bass	0	0.0000
		Striped bass hybrid	2	0.0495
		Walleye	10	0.2475
		White catfish	0	0.0000
		White bass	1	0.0248
		Season Total	69	1.7079
	162.20		207	1.2762

Table 5.17

CATCH PER UNIT EFFORT (CPUE AS FISH/ELECTROFISHING MINUTE) BY SEASON DURING THE BVPS 2005 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Spring	41	Black buffalo	5	0.1220
		Black crappie	1	0.0244
		Channel catfish	3	0.0732
		Freshwater drum	1	0.0244
		Gizzard shad	8	0.1951
		Golden redhorse sucker	19	0.4634
		Highfin carpsucker	1	0.0244
		Longnose gar	2	0.0488
		Quillback	1	0.0244
		Sauger	3	0.0732
		Shorthead redhorse sucker	4	0.0976
		Silver redhorse	3	0.0732
		Smallmouth bass	1	0.0244
		Spotfin shiner	1	0.0244
		Walleye	1	0.0244
		Season Total	54	1.3171
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Summer	40	Black buffalo	1	0.0250
		Channel catfish	1	0.0250
		Flathead catfish	1	0.0250
		Gizzard shad	14	0.3500
		Golden redhorse sucker	5	0.1250
		Longnose gar	1	0.0250
		Mooneye	1	0.0250
		Shorthead redhorse sucker	4	0.1000
		Smallmouth bass	1	0.0250
		White bass	2	0.0500
		Season Total	31	0.7750

Table 5.17 continued

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Fall	40	Black Buffalo	4	0.1000
		Channel catfish	1	0.0250
		Flathead catfish	2	0.0500
		Gizzard shad	24	0.6000
		Golden redhorse	3	0.0750
		Mooneye	1	0.0250
		Quillback	4	0.1000
		Sauger	2	0.0500
		Shorthead redhorse sucker	6	0.1500
		Silver redhorse	2	0.0500
		Smallmouth bass	1	0.0250
		Walleye	1	0.0250
		White bass	25	0.6250
		Season Total	76	1.9000
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Winter	41	Black buffalo	12	0.2927
		Bluegill	2	0.0488
		Common carp	2	0.0488
		Creek chub	2	0.0488
		Freshwater drum	1	0.0244
		Gizzard shad	18	0.4390
		Golden redhorse sucker	8	0.1951
		Mooneye	4	0.0976
		Quillback	8	0.1951
		River carpsucker	2	0.0488
		Sauger	14	0.3415
		Shorthead redhorse sucker	20	0.4878
		Silver redhorse	1	0.0244
		Smallmouth bass	5	0.1220
		Spotted bass	2	0.0488
		Walleye	2	0.0488
		White bass	17	0.4146
		Season Total	120	2.9268
	162		281	1.7346

Table 5.18

CATCH PER UNIT EFFORT
(CPUE AS FISH/ELECTROFISHING MINUTE)
BY SEASON DURING THE BVPS 2006 FISHERIES SURVEY

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Spring	41	Black buffalo	10	0.2439
		Black crappie	1	0.0244
		Gizzard shad	9	0.2195
		Golden redhorse sucker	19	0.4634
		Quillback	2	0.0488
		River carpsucker	0	0.0000
		Sauger	17	0.4146
		Shorthead redhorse sucker	16	0.3902
		Skipjack herring	1	0.0244
		Smallmouth bass	11	0.2683
		Spotted bass	5	0.1220
		Striped bass x White bass	1	0.0244
		Walleye	10	0.2439
		White bass	15	0.3659
		Season Total	117	2.8537
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Summer	40	Black buffalo	2	0.0500
		Black crappie	1	0.0250
		Gizzard shad	3	0.0750
		Golden redhorse sucker	4	0.1000
		Highfin carpsucker	0	0.0000
		Longnose gar	2	0.0500
		Shorthead redhorse sucker	12	0.3000
		Silver redhorse	1	0.0250
		Smallmouth bass	3	0.0750
		Season Total	28	0.7000

Table 5.18 Continued

Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Fall	40	Black buffalo	3	0.0732
		Bluegill	1	0.0244
		Carp	3	0.0732
		Gizzard shad	5	0.1220
		Golden redhorse sucker	2	0.0488
		Longnose gar	4	0.0976
		Mooneye	1	0.0244
		Quillback	2	0.0488
		Sauger	5	0.1220
		Shorthead redhorse sucker	14	0.3415
		Silver redhorse	1	0.0244
		Smallmouth bass	2	0.0488
		Spotted bass	1	0.0244
		White bass	1	0.0244
		Season Total	45	1.1250
Season	Effort (min)	Common Name	Number Collected	CPUE (fish/min)
Winter	40	Black buffalo	18	0.4500
		Carp	1	0.0250
		Channel catfish	1	0.0250
		Flathead catfish	1	0.0250
		Freshwater drum	4	0.1000
		Gizzard shad	18	0.4500
		Golden redhorse sucker	2	0.0500
		Mooneye	3	0.0750
		Northern hog sucker	0	0.0000
		Quillback	6	0.1500
		River carpsucker	1	0.0250
		Shorthead redhorse sucker	11	0.2750
		Walleye	1	0.0250
		White bass	1	0.0250
		Season Total	68	1.7000
	161		258	1.6025

TABLE 5.19

UNIT 1 COOLING RESERVOIR MONTHLY SAMPLING <u>CORBICULA</u> DENSITY DATA FOR 2006 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)
4/12/2006	0.25	Dead	1	0.001-0.99	0.001-0.99	43
		Live	0	-	-	0
5/23/2006	0.25	Dead	0	-	-	0
		Live	0	-	-	0
6/22/2006	0.25	Dead	0	-	-	0
		Live	0	-	-	0
7/19/2006	0.25	Dead	1	6.30-9.49	6.30-9.49	43
		Live	0	-	-	0
8/17/2006	0.25	Dead	4	1.00-1.99	1.00-1.99	172
		Live	0	-	-	0
9/25/2006	0.25	Dead	0	-	-	0
		Live	0	-	-	0
10/18/06*	0.25	Dead	0	-	-	0
		Live	0	-	-	0
11/2/2006*	0.25	Dead	0	-	-	0
		Live	0	-	-	0
Unit summary		Dead	6	6.30-9.49	0.001-0.99	32
		Live	0	-	-	0

*Cooling Tower dewatered; not sampled.

TABLE 5.20

UNIT 2 COOLING RESERVOIR MONTHLY SAMPLING <u>CORBICULA</u> DENSITY DATA FOR 2006 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)
4/12/2006	0.25	Dead	0	-	-	0
		Live	0	-	-	0
5/23/2006	0.25	Dead	5	3.35-4.74	2.00-3.34	215
		Live	1	3.35-4.74	3.35-4.74	43
6/22/2006	0.25	Dead	18	3.35-4.74	1.00-1.99	774
		Live	13	4.75-6.29	1.00-1.99	559
7/19/2006	0.25	Dead	6	4.75-6.29	1.00-1.99	258
		Live	4	3.35-4.74	1.00-1.99	172
8/17/2006	0.25	Dead	0	-	-	0
		Live	0	-	-	0
9/25/2006	0.25	Dead	0	-	-	0
		Live	0	-	-	0
10/18/2006	0.25	Dead	0	-	-	0
		Live	5	4.75-6.29	0.001-0.99	215
11/2/2006	0.25	Dead	1	0.001-0.99	0.001-0.99	43
		Live	0	-	-	0
Unit summary		Dead	30	4.75-6.29	0.001-0.99	167
		Live	23	4.75-6.29	0.001-0.99	124

FIGURES

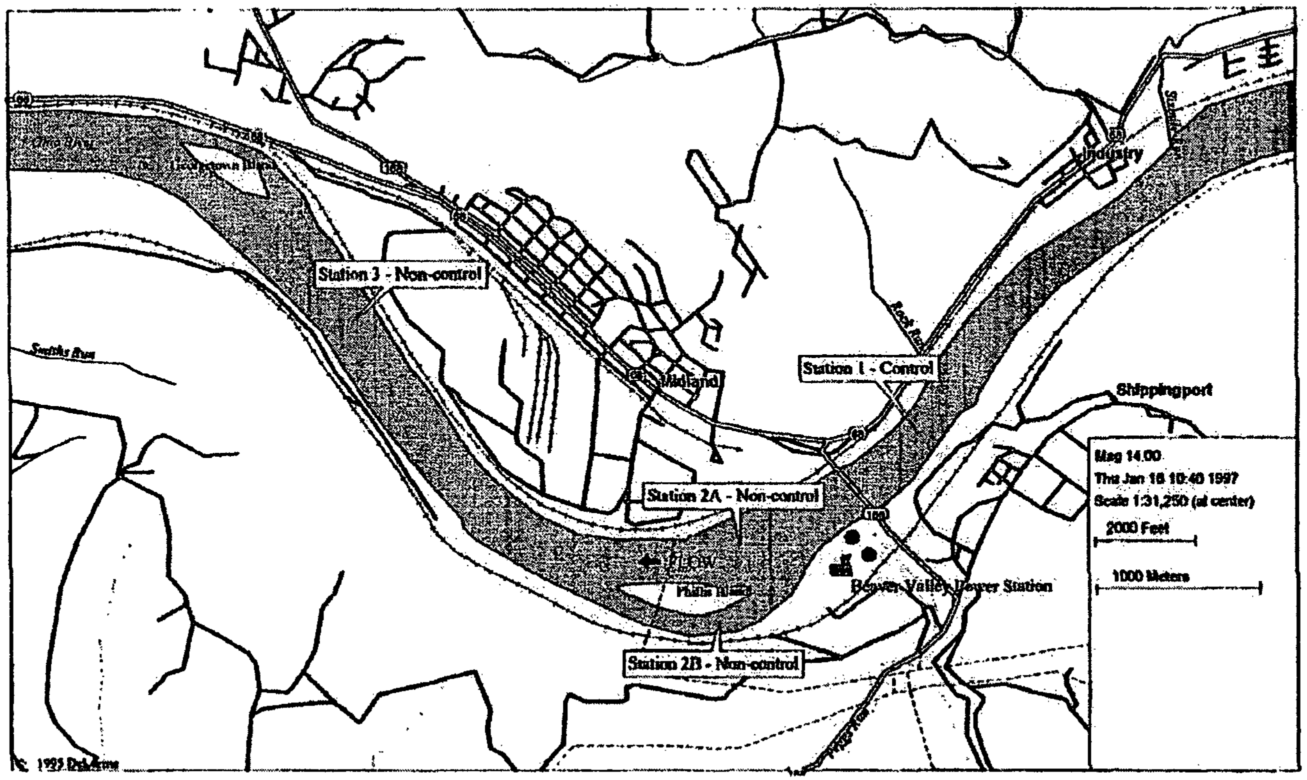


Figure 5.1 2006 Beaver Valley Power Station Aquatic Monitoring Program Sampling Control and Non-Control Sampling Stations

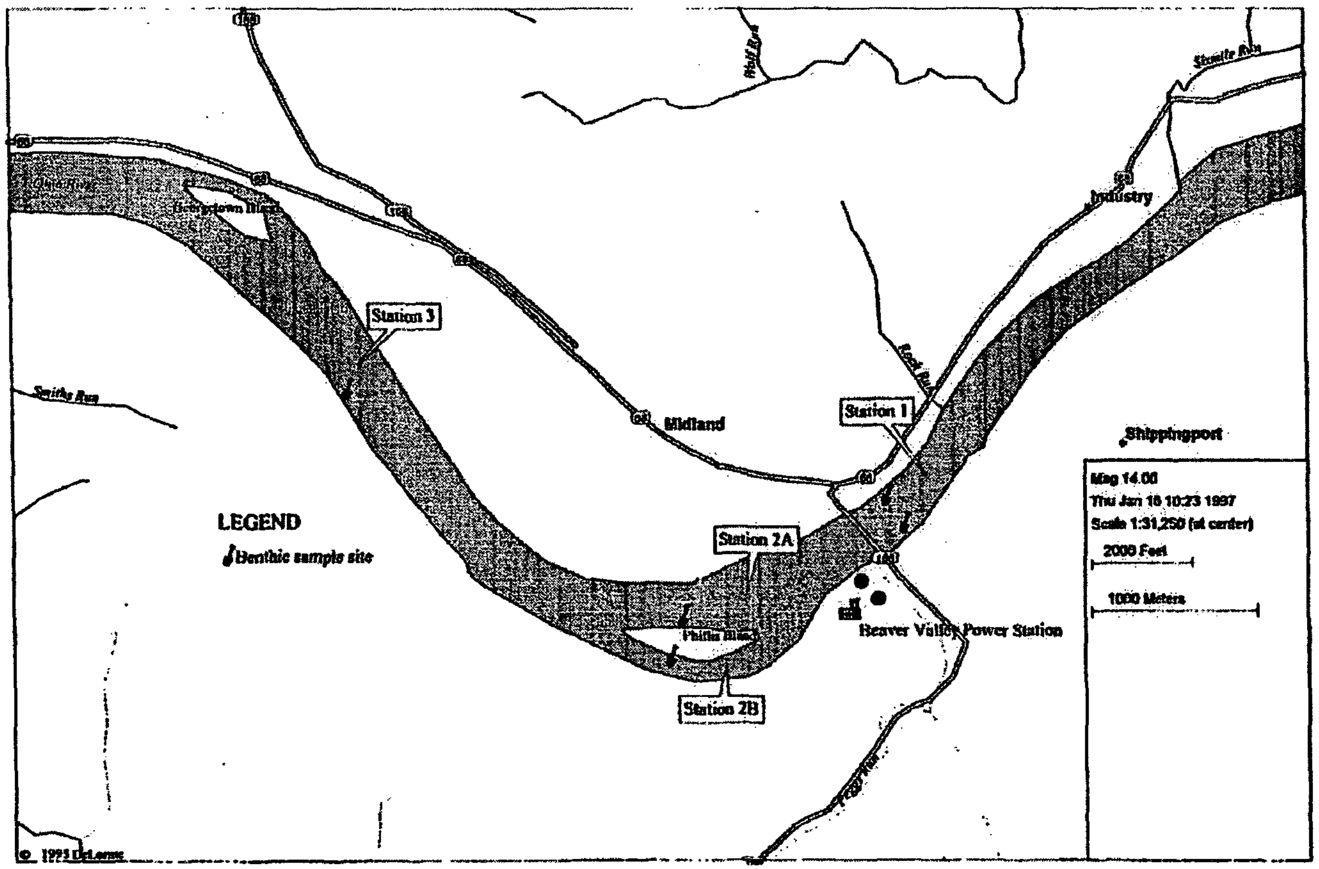


Figure 5.2: 2006 Beaver Valley Power Station Benthic Organism Sampling Sites

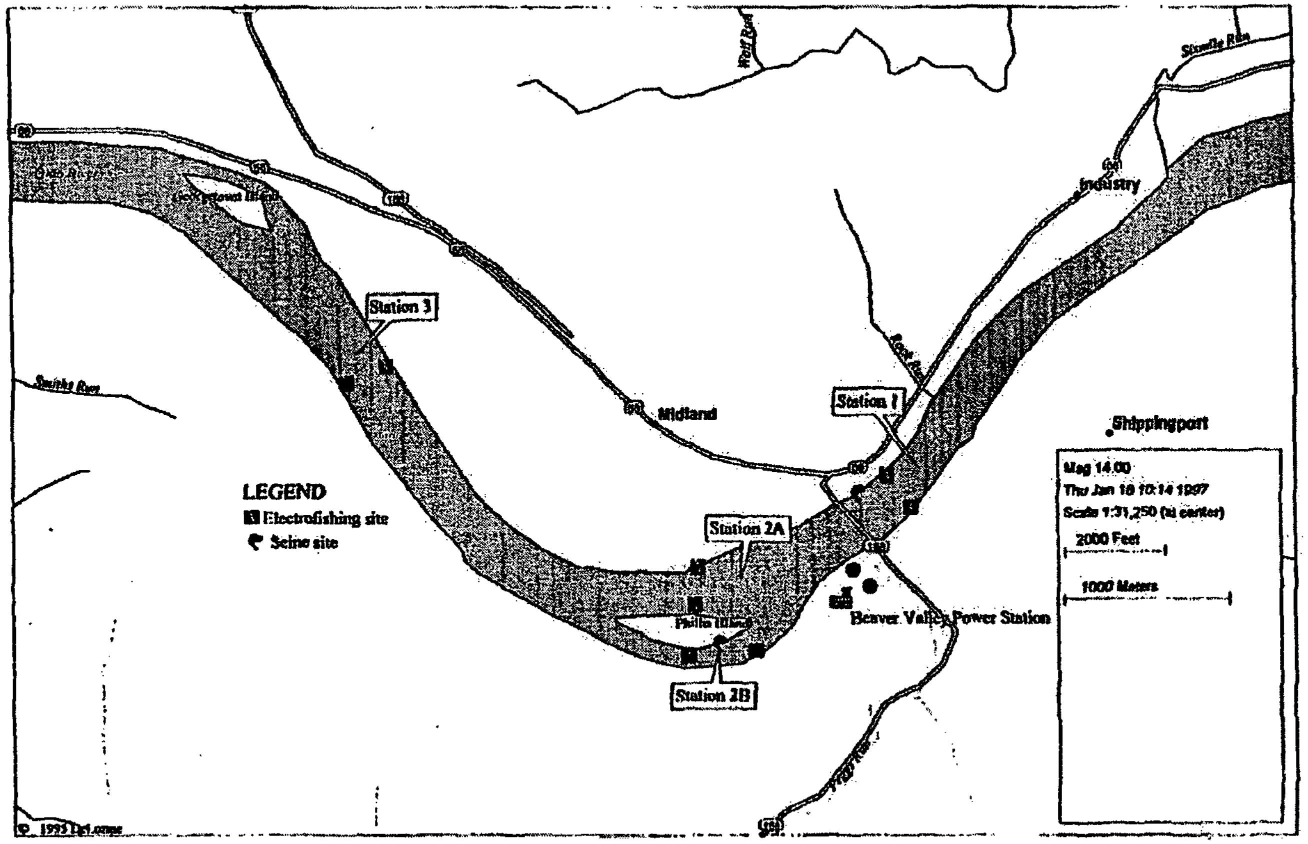
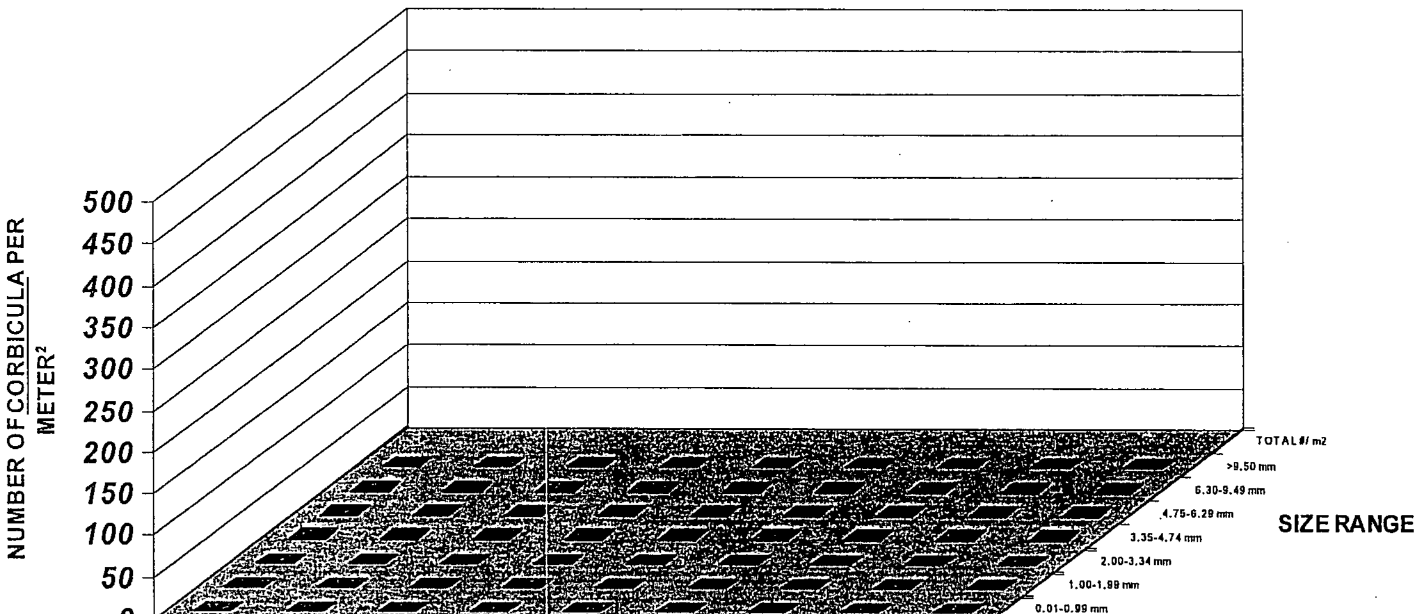


Figure 5.3 2006 Beaver Valley Power Station Fish Population Survey Fish Sampling Sites

Figure 5.4 Location of Study Area, Beaver Valley Power Station Shippingport, Pennsylvania BVPS

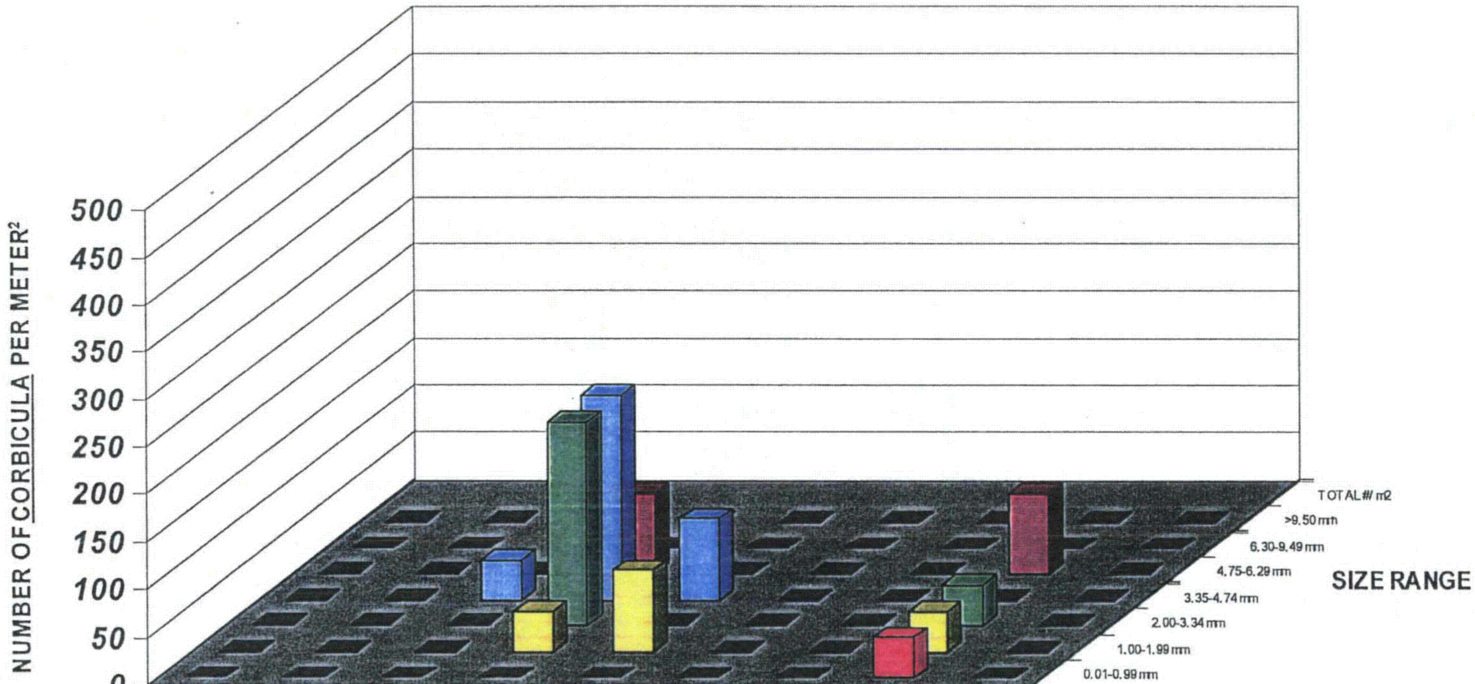
Comparison of live Corbicula clam density estimates among 2006 BVPS Unit 1 cooling tower reservoir events, for various clam shell groups.



		4/12	5/23	6/22	7/19	8/17	9/25	10/18	11/2
0.01-0.99 mm	0	0	0	0	0	0	0	0	0
1.00-1.99 mm	0	0	0	0	0	0	0	0	0
2.00-3.34 mm	0	0	0	0	0	0	0	0	0
3.35-4.74 mm	0	0	0	0	0	0	0	0	0
4.75-6.29 mm	0	0	0	0	0	0	0	0	0
6.30-9.49 mm	0	0	0	0	0	0	0	0	0
>9.50 mm	0	0	0	0	0	0	0	0	0
TOTAL #/m2	0	0	0	0	0	0	0	0	0

Figure 5.5

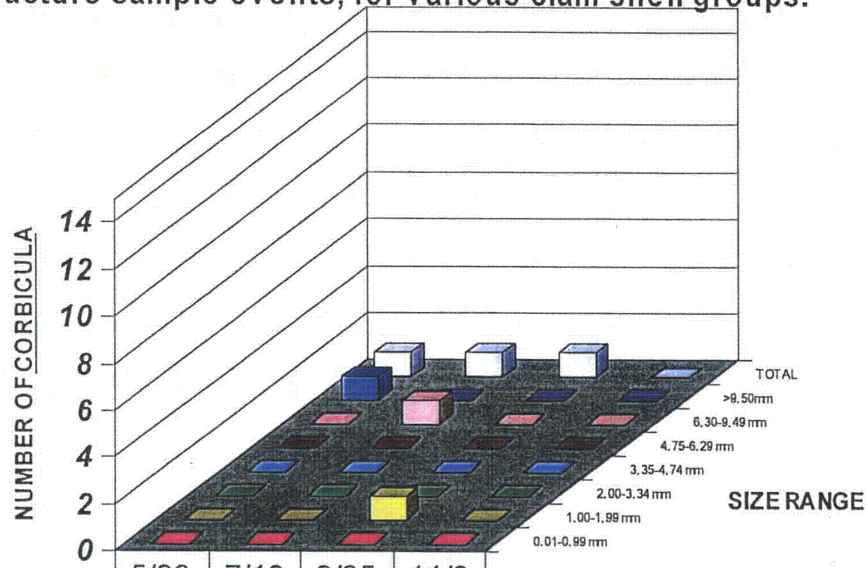
Comparison of live Corbicula clam density estimates among 2006 BVPS Unit 2 cooling tower reservoir events, for various clam shell groups.



		4/12	5/23	6/22	7/19	8/17	9/25	10/18	11/2
0.01-0.99 mm	0	0	0	0	0	0	0	43	0
1.00-1.99 mm	0	0	0	43	86	0	0	43	0
2.00-3.34 mm	0	0	0	215	0	0	0	43	0
3.35-4.74 mm	0	0	43	215	86	0	0	0	0
4.75-6.29 mm	0	0	0	86	0	0	0	86	0
6.30-9.49 mm	0	0	0	0	0	0	0	0	0
>9.50 mm	0	0	0	0	0	0	0	0	0
TOTAL#/m2	0	0	43	559	172	0	0	215	0

Figure 5.6

Comparison of live Corbicula clam density estimates among 2006 BVPS Intake Structure sample events, for various clam shell groups.

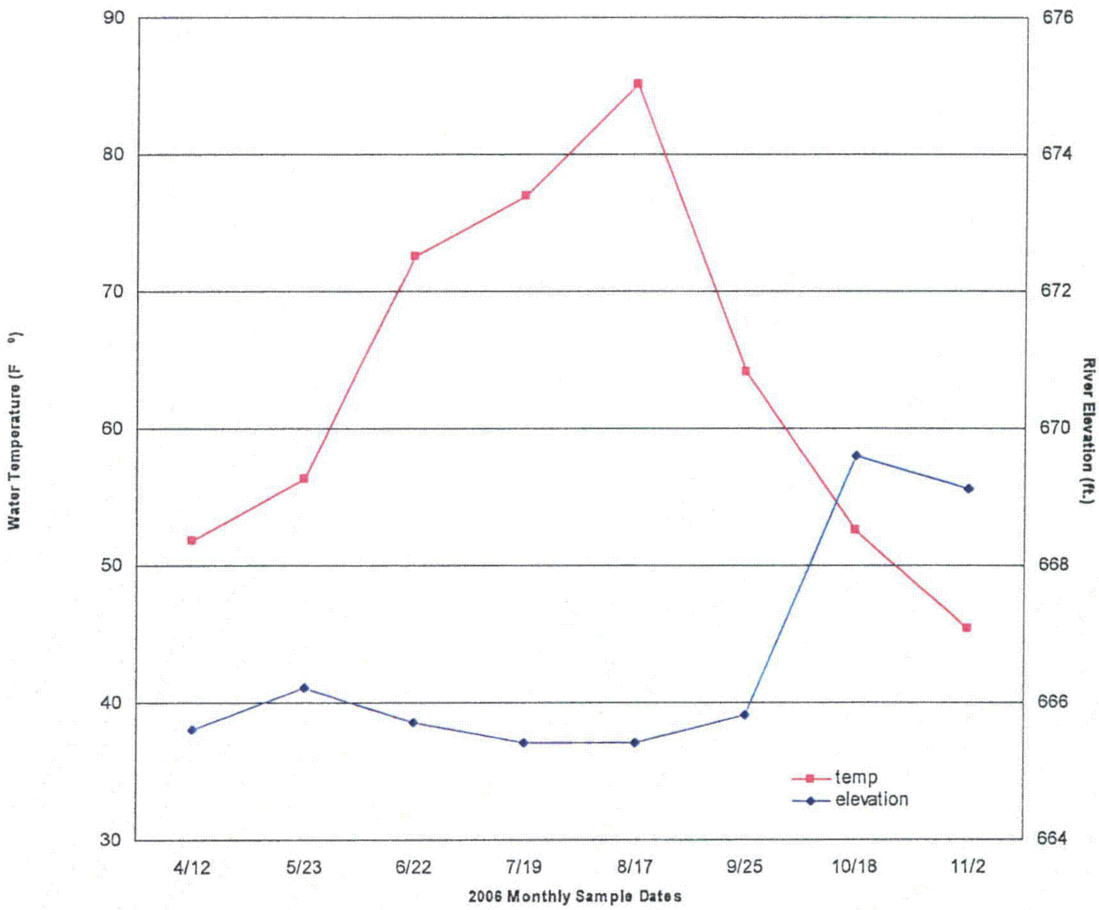


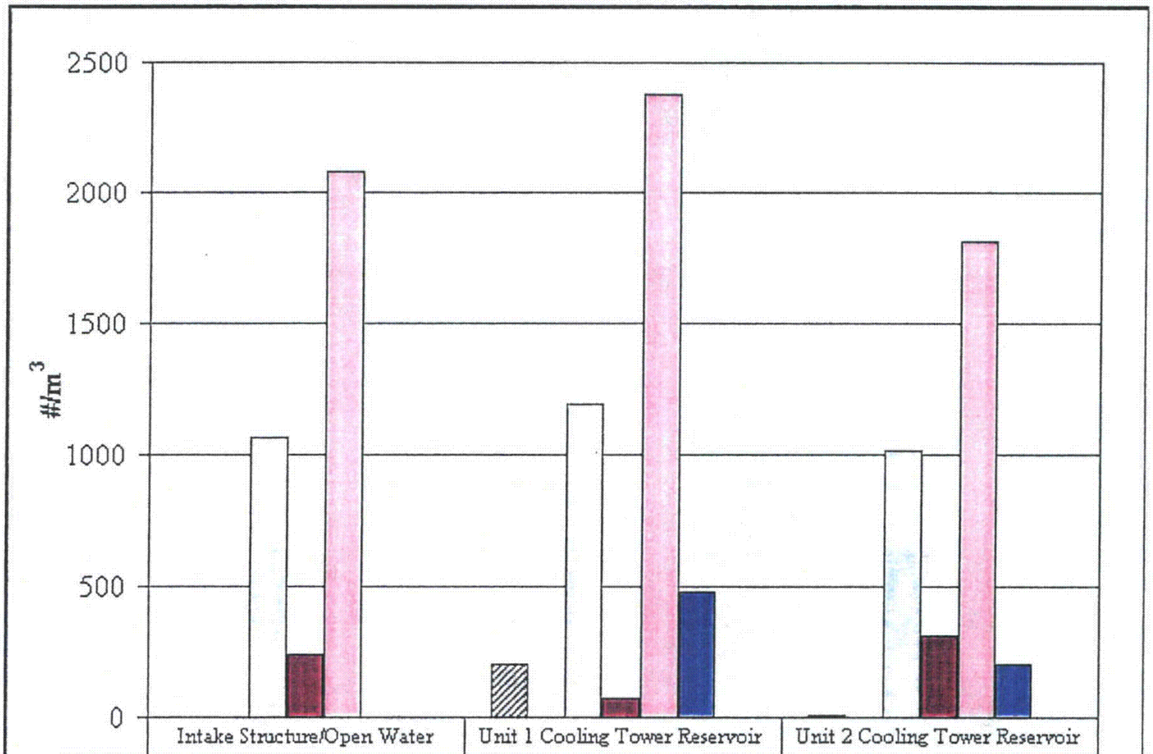
	5/23	7/19	9/25	11/2
0.01-0.99 mm	0	0	0	0
1.00-1.99 mm	0	0	1	0
2.00-3.34 mm	0	0	0	0
3.35-4.74 mm	0	0	0	0
4.75-6.29 mm	0	0	0	0
6.30-9.49 mm	0	1	0	0
>9.50mm	1	0	0	0
TOTAL	1	1	1	0

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

Figure 5.7

Figure 5.8
Water Temperature and River Elevation Recorded at the Ohio River at BVPS Intake Structure During 2006 on Monthly Sample Dates.



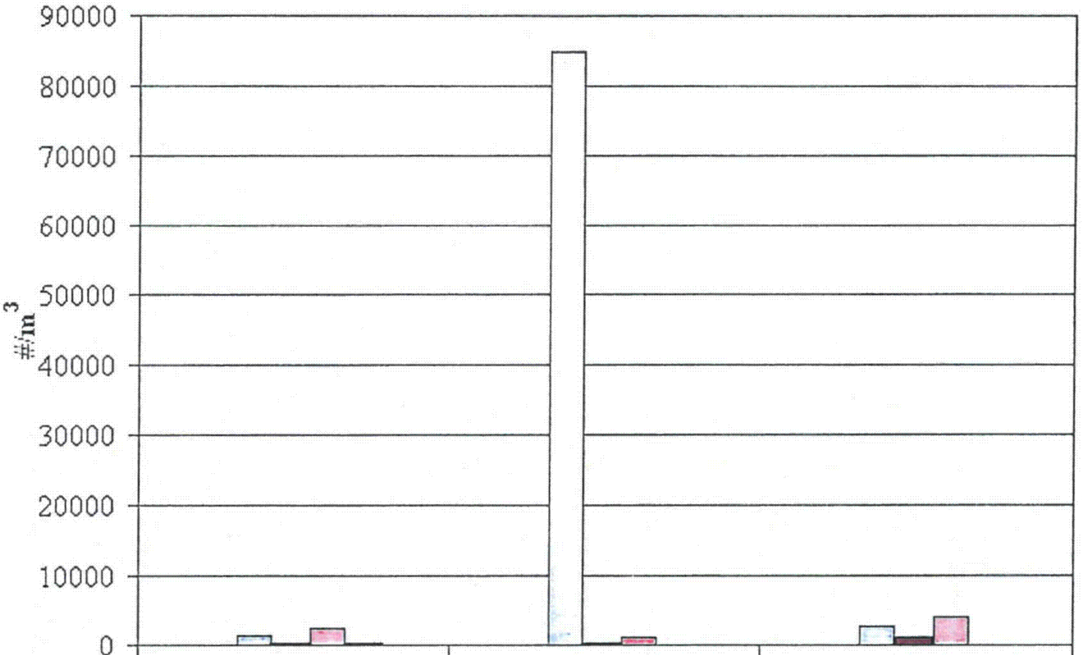


	Intake Structure/Open Water	Unit 1 Cooling Tower Reservoir	Unit 2 Cooling Tower Reservoir
4/12	0	201	9
5/23	0	0	0
6/22	1060	1190	1010
7/19	240	70	310
8/17	2080	2380	1810
9/25	0	480	200
10/18	0	0	0

Sample location

Figure 5.9. Density of zebra mussels veligers collected at Beaver Valley Power Station, 2006.

Note: Cooling Tower 2 Dewatered in October; Not Sampled.

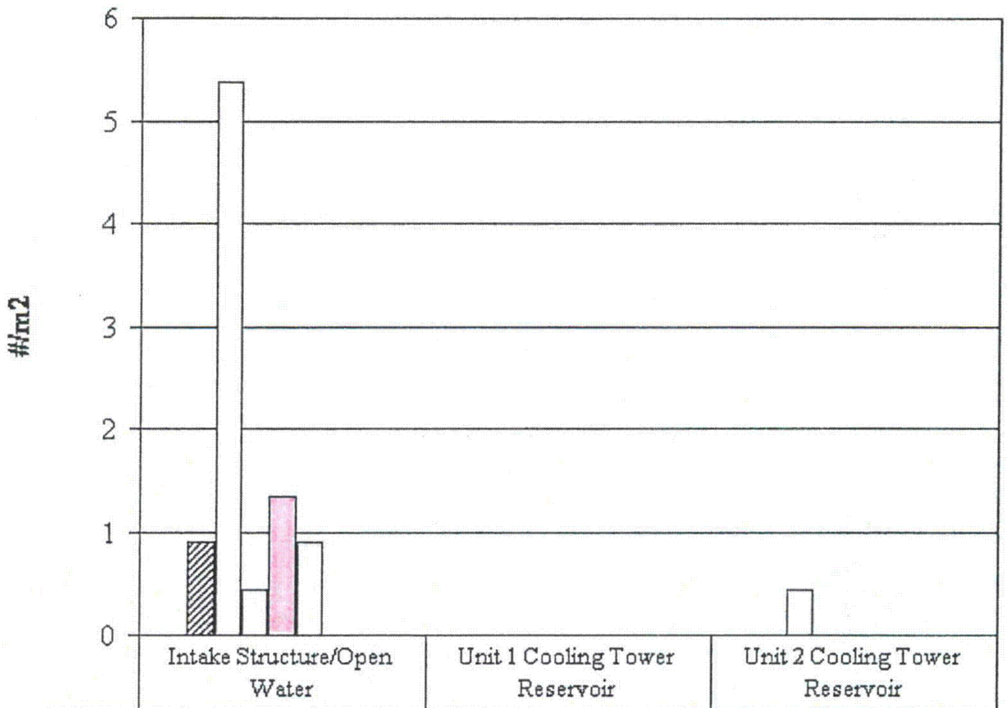


	Barge Slip	Splash Pool	Emergency Outfall Facility
4/12	0	0	0
5/23	10	0	0
6/22	1450	85000	2640
7/19	320	150	1110
8/17	2460	1000	4114
9/25	150	10	30
10/18	0	0	0

Sample location

Figure 5.10. Density of zebra mussels veligers collected at Beaver Valley Power Station, 2006.

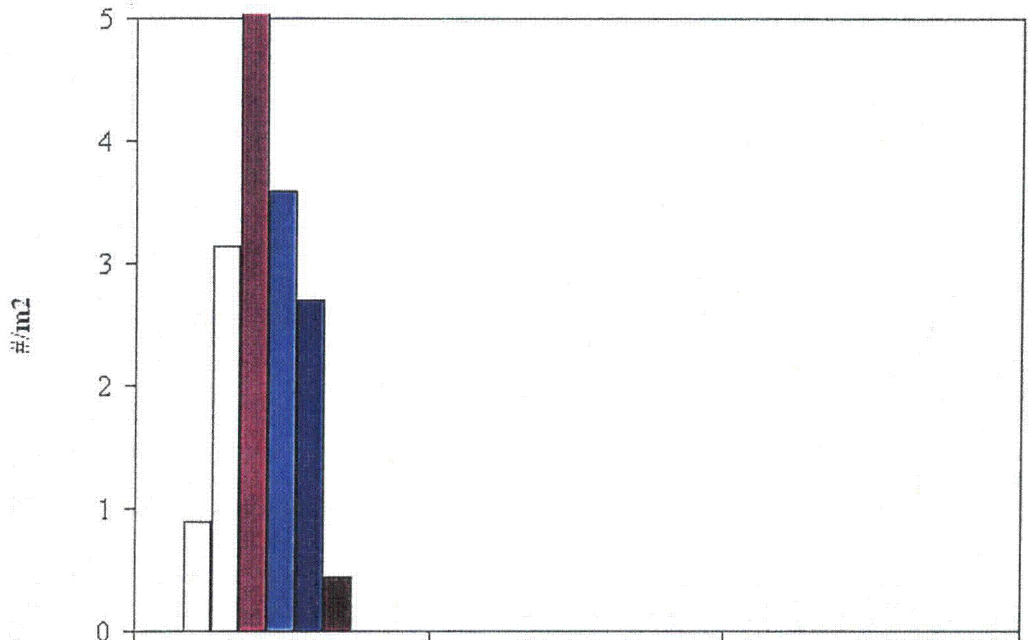
Note: Barge Slip Not Sampled Due to High Water.



	Intake Structure/Open Water	Unit 1 Cooling Tower Reservoir	Unit 2 Cooling Tower Reservoir
	0	0	0
4/12	1	0	0
5/23	5	0	0
6/22	0	0	0
7/19	1	0	0
8/17	1	0	0
9/25	0	0	0
10/18	0	0	0
11/2	0	0	0

Figure 5.11. Density of settled zebra mussels at Beaver Valley Power Station, 2006.

Note: Cooling Tower 1 Dewatered in October and November; Not Sampled.



	Barge Slip	Splash Pool	Emergency Outfall Facility
	0	0	0
4/12	1	0	0
5/23	3	0	0
6/22	6	0	0
7/19	4	0	0
8/17	3	0	0
9/25	0	0	0
10/18	0	0	0
11/2	0	0	0

Figure 5.12. Density of settled zebra mussels at Beaver Valley Power Station, 2006.

Note: Barge Slip Not Sampled on October 18 Due to High Water

10.0

ATTACHMENTS

Attachment 10.1: Permits & Certificates For Environmental 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.*
GP05046203	General Permit for sewage conveyance project to the Shippingport Borough Municipal Wastewater treatment facility.	Upon project completion.
04-13281	BVPS Unit 1 PA DEP Facility Identification & certificate number for regulated storage tanks.	Indefinite
04-13361	BVPS Unit 2 PA DEP Facility Identification & certificate number for regulated storage tanks.	Indefinite
Pending State Only Application for: 04-302-055, 04-309-004, 04-399-006 04-399-005A OP-04-00086	PA DEP Air operating permits currently under application for state-only permit for emergency diesel generators and auxiliary boilers.	Indefinite
N/A	PA DEP Open Burning Permit for operation of the BVPS Fire School- annual application and renewal	12/31/2007
060503 4450 004L	US Department of Transportation Hazardous Materials Registration renewed annually	06/30/2006
200100242	US Army Permit for maintenance dredging (With Encroachment/Submerged Lands Agreement #0477705, this allows maintenance dredging.).	12/31/2011
0477705	Encroachment Permit/Submerged Lands Agreement for construction and maintenance of current barge slip. (With US Army Permit #200100242, this allows maintenance dredging.)	Indefinite
06786A	Encroachment Permit/Submerged Lands Agreement for transmission line over Ohio River @ Mile 34.5	Indefinite
18772	Encroachment Permit/Submerged Lands Agreement for Unit 1 entrance road culvert	Completed
19184	Encroachment Permit/Submerged Lands Agreement for original Unit 1 construction barge slip	Completed
18737	Encroachment Permit/Submerged Lands Agreement for Unit 1 intake and discharge (main combined intake and outfall structures)	Indefinite
19522	Encroachment Permit/Submerged Lands Agreement for Peggs Run relocation	Completed
0473734	Encroachment Permit/Submerged Lands Agreement for Peggs Run sheet piling retaining wall	Completed
0475711	Encroachment Permit/Submerged Lands Agreement for construction and maintenance of Unit 2 auxiliary intake	Indefinite
0476713	Encroachment Permit/Submerged Lands Agreement for cantilever sheet pile wall	Completed
0477706	Encroachment Permit/Submerged Lands Agreement for parking lot fill	Completed
0477723	Encroachment Permit/Submerged Lands Agreement for Unit 1 & Unit 2 culvert closing	Complete
E-04-78	Encroachment Permit/Submerged Lands Agreement for emergency outfall structure/impact basin	Completed
E-04-85	Encroachment Permit/Submerged Lands Agreement for Unit 1 storm sewer	Completed