ILLINOIS POLLUTION CONTROL BOARD
November 20, 2014

SOUTHERN ILLINOIS POWER, COOPERATIVE,	)	
Petitioner,	)	
v.	)	PCB 14-129 (Thermal Demonstration)
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,	)	
Respondent.	)	

OPINION AND ORDER OF THE BOARD (by C.K. Zalewski):

On May 13, 2014, Southern Illinois Power, Cooperative (SIPC) filed a petition with the Board requesting an alternative thermal effluent limitation for heated discharge from its Marion Generating Station (Marion Station) into the Lake of Egypt. The petition requests alternative limitations from those imposed by Special Condition 4 of SIPC's National Pollutant Discharge Elimination System (NPDES) permit. SIPC seeks this relief pursuant to Section 316(a) of the Clean Water Act (CWA) (33 U.S.C. § 1326(a)), Section 304.141(c) of the Board's Water Pollution regulations (35 Ill. Adm. Code 304.141(c)), and the Board's Subpart K procedural rules (35 Ill. Adm. Code 106.Subpart K). Marion Station and Lake of Egypt are located approximately seven miles south of Marion in Williamson and Johnson Counties.

On June 26, 2014, the Illinois Environmental Protection Agency (Illinois EPA or Agency) filed a recommendation (Rec.) that the Board grant SIPC's petition with conditions. On July 17, 2014, SIPC responded to Illinois EPA's recommendation (Res.) and accepted the proposed conditions. No other federal or Illinois agency provided any comment or presented any concern to the Board.

Notice of SIPC's petition was published in the *Daily Republican* on May 22, 2014. In its petition, SIPC requested a hearing, however SIPC withdrew that request on September 12, 2014. No other person requested that the Board hold a hearing and, therefore, the Board did not hold a hearing.

Based on the record before it, the Board finds that SIPC has not provided the Board with sufficient information to demonstrate that limits imposed by 35 Ill. Adm. Code 302.102(b)(8) and 303.331 are more stringent than necessary to assure the protection and propagation of a balanced and indigenous population of shellfish, fish, and wildlife in and on Lake of Egypt. In the order below, the Board provides an overview of SIPC's petition process and the Illinois EPA's recommendation along with SIPC's response. The Board next explains the standard relied upon by the Board in reviewing SIPC's petition before describing the informational shortcomings of SIPC's petition. Finally, the Board concludes that due to the lack of support for

SIPC's low potential impact determinations and an insufficient Representative Important Species (RIS) analysis, SIPC's petition is denied.

PRE-PETITION EARLY SCREENING AND DETAILED PLAN OF STUDY

Board rules provide for pre-petition communications between the petitioner and Illinois EPA. Prior to filing a petition with the Board, the petitioner must submit early screening information to Illinois EPA including a description of the requested alternative standard, how the petitioner will make the required demonstration, and types of data the petitioner intends to submit. 35 Ill. Adm. Code 106.1115(a). Within thirty days after submitting the early screening information to Illinois EPA, the petitioner must consult with Illinois EPA to discuss the information. 35 Ill. Adm. Code 106.1115(b). Within sixty days after the petitioner submits the early screening information to Illinois EPA, the petitioner must submit a detailed plan of study to Illinois EPA. 35 Ill. Adm. Code 106.1120(a). Within ninety days after the petitioner's submittal, Illinois EPA must respond in writing to either approve the plan or recommend changes. 35 Ill. Adm. Code 106.1120(f). The petitioner must then complete the plan of study prior to filing a petition with the Board. 35 Ill. Adm. Code 106.1120(g).

SIPC's petition relies on research conducted by Southern Illinois University Carbondale (SIUC) and research conducted by AMEC Environment & Infrastructure, Inc. (AMEC.). Pet. at 10. SIUC began studying the effect of Marion Station's thermal discharges on Lake of Egypt in the 1970's. *Id*. Those studies were primarily authored by Dr. Roy Heidinger of SIUC. Pet. at 19. Dr. Heidinger's studies focused on game fish and their forage base and were relied upon in management of the Lake of Egypt fishery. *Id*. Dr. Heidinger's findings contain information about the ecology of Lake of Egypt and are included in the record.

In the *Status of Sport Fish Populations in Lake of Egypt and Management Recommendations*, dated September 1990, Dr. Heidinger describes the lake as having "species of fish normally associated with southern Illinois reservoirs, including, but not limited to largemouth bass, white and black crappie, bluegill, green sunfish, longear, channel catfish, carp, gizzard shad, and spotted sucker." Pet. Exh. B, App. E at 1. The SIUC studies focus on the fishery and how the populations of recreational fishing species have fluctuated over time, rather than the general ecology of the Lake of Egypt.

SIPC hired AMEC to perform studies on the Lake of Egypt beginning in 2006. *Id*. AMEC's research on the effects of Marion Station's thermal discharge into Lake of Egypt had a two-fold purpose: first, to fulfill Special Condition 7 of SIPC's NPDES permit, that requires SIPC to demonstrate "that thermal discharge from Marion Generating Station will not cause and cannot reasonably be expected to cause significant ecological damage to Lake of Egypt;" pursuant to Section 302.211(f) of the Board's water pollution regulations (35 Ill. Adm. Code 302.211(f)); and to support SIPC's petition for an alternative thermal effluent standard under Section 316(a) of the CWA. Pet. Exh. B at 1; *see* Pet. Exh. A at 6. AMEC's study on Lake of Egypt resulted in a document entitled *Evaluation of Site-Specific Thermal Standards at Marion Power Plant*, which is included in the record as Exhibit B to SIPC's petition ('AMEC evaluation', cited as Pet. Exh. B). Information gathered by these two organizations informed

SIPC's early screening discussions with Illinois EPA to address Section 106.1115(a) of the Board's regulations.

On February 20, 2014, the Board adopted Sections 106.1115 and 106.1120 of the Board's procedural rules for alternative thermal effluent limitation petitions. *See* Procedural Rules for Alternative Thermal Effluent Limitations under Section 316(a) of the Clean Water Act, R13-20. The Board's rules became effective on February 26, 2014, and SIPC submitted its petition on May 13, 2014. The early screening discussions between SIPC and Illinois EPA began in 2010. *See* Pet. at 10-11. Thus, as acknowledged in the petition, much of the demonstration contained in SIPC's petition and the underlying studies and data pre-date the Board's procedural rules. Pet. at 11. For its part, Illinois EPA acknowledges that it is satisfied with SIPC's pre-petition communications. Rec. at 6. In a letter dated April 15, 2014, Illinois EPA acknowledged the communications with SIPC regarding a Section 316(a) demonstration stating that "[t]he Agency believes that this facility does not need to complete the new requirements of Section 106.1115 (Early Screening) and Section 106.1120 (Detailed Plan of Study)." Pet. Exh. E.

SIPC'S PETITION

On May 13, 2014, SIPC filed a petition with the Board for alternative thermal effluent limitations for discharge from Marion Station requesting relief from limits imposed by SIPC's NPDES permit and 35 Ill. Adm. Code 302.211. SIPC filed its petition with five exhibits including its NPDES permit (Exh. A), and the AMEC evaluation (Exh. B). Other exhibits to the petition include: a map of Lake of Egypt with rules and regulations of the Lake (Exh. C); a map of the Shawnee National Forest (Exh. D); and the April 15, 2014 Illinois EPA letter acknowledging SIPC's efforts with regard to the early screening and detailed plan of study requirements, mentioned above (Exh.E). SIPC also attached six appendices to the AMEC evaluation:

Appendix A. Marion Power Plant 316(b) Impingement Mortality Characterization Report;

Appendix B. Surface Water Temperatures along Five Transects in the Lower Portion of the Lake of Egypt;

Appendix C. AmerenCIPC Newton Lake Project, 15 August 1997—30 August 1999 (Volume 2);

Appendix D. Current Status of Sport Fish Populations in Lake of Egypt-1998;

Appendix E. Status of Sport Fish Populations in Lake of Egypt and Management Recommendations-1990; and

Appendix F. Supplemental Spring and Fall Hydrothermal Modeling.

SIPC served a copy of the petition on Illinois EPA and Illinois Department of Natural Resources (Illinois DNR) on June 11, 2014. On June 12, 2014, SIPC filed a certificate of

publication indicating that notice of the petition was published on May 22, 2014 in the *Daily Republican*. *See* 35 Ill. Adm. Code 106.1135(a), 106.1140. The notice was timely and met the content requirements of 35 Ill. Adm. Code 106.1135. Any request for public hearing must have been received by the Board no later than June 12, 2014. The Board did not receive any request for hearing and did not hold a hearing.

Illinois EPA filed its recommendation on June 26, 2014. Illinois EPA recommends the Board grant SIPC's requested relief, subject to conditions. Rec. at 4; *see infra* at 9-10. On July 17, 2014, SIPC filed its response to the Agency's recommendation stating that SIPC agrees with Illinois EPA's proposed conditions. Res. at 2; *see infra* at 10.

MARION GENERATING STATION AND LAKE OF EGYPT

Description of Marion Station

SIPC is a consumer-owned electric power generation and transmission cooperative headquartered in Marion, Williamson County. Pet. at 5. SIPC operates Marion Station, a coal-fired power plant located approximately seven miles south of the City of Marion. Marion Station consists of four power generating units, two of which are coal-fired boilers and two of which are simple-cycle units. *Id*. The first boiler began producing steam to Unit 4 in 1978. The second boiler was introduced in 2003 and provides steam to three smaller turbines, Unit 123. *Id*. These two turbine units combine with the two simple-cycle units (Units 5 and 6) for 383 total megawatts of generating power at Marion Station. *Id*. The four turbines (Unit 4 and Unit 123) use once-through cooling and share a common cooling water intake and discharge structure. Pet. Exh. B at 1. Circulating water cools the boiler condensate systems which consist of the main condenser, two condensate pumps, air ejection equipment, drain cooler, two low pressure heaters and associated piping and valves. SIPC has no plans to retire Unit 4 or Unit 123 and has no plans to add units to Marion Station. Pet. at 6. In its petition, SIPC provided the following list of shutdowns for Unit 123 and Unit 4:

Unit 123

Year	Number of Shutdowns	Scheduled Hours	Unscheduled Hours
2009	12	537	416
2010	5	713	65
2011	8	748	37
2012	8	839	63
2013	9	1129	98

Unit 4

Year	Number of Shutdowns	Scheduled Hours	Unscheduled Hours
2009	23	785	538
2010	13	1256	373
2011	13	963	387
2012	11	1109	372
2013	13	864	330

Pet. at 6-7.

Lake of Egypt

SIPC states that Lake of Egypt was created in 1963 "before water quality standards or effluent limits existed, and even before artificial cooling lakes were deemed waters of the State." Pet. at 7-8. The lake was created by damming the South Fork of the Saline River for the purpose of cooling thermal effluent from Marion Station. Pet. at 7. Since Lake of Egypt's creation, Marion Station has drawn water from it to cool the boiler units and then discharged the cooling water back into the lake. Between Marion Station's cooling water intake and discharge extends a long, narrow dike "providing a flow path for warm discharge water to allow for greater duration of mixing, evaporative cooling, and convective heat dissipation before the water is recirculated back to" Marion Station. Pet. at 9.

In its petition, SIPC explains that water is discharged into Lake of Egypt at an approximate rate of 187,000 gallons per minute at a maximum instantaneous temperature ranging from 78° to 124° F. Pet. at 9. SIPC estimates that the discharge temperature is approximately 25° to 30° F warmer than the intake temperature. *Id*. SIPC explains the variation in discharge temperature and its effect on the temperature of Lake of Egypt as follows:

> The variation in temperature increase is mostly related to change in pumping rate. Flow rates will change depending on the number of circulation water pumps in operation and applied resistance to flow in the condensers. The heated water flows into the lake mixing zone where it settles into an upper layer of heated water over the existing lake water with some amount of mixing at the boundary between the two layers. This separation is caused by differences in density and is referred to as 'stratification', a common natural phenomenon in lakes. The heated water is cooled by evaporation, convection heat transfer with the air, convection heat transfer with the lower water layers, and thermal radiation to the atmosphere. A reduction in temperature is also obtained due to mixing of the heated water with lower temperature water from the other portions of the lake or from precipitation and runoff into the mixing zone. Discharge water over time dissipates the accumulated thermal energy to the greater environment or is recirculated into the unit once again. Repeated passes through the condensers results in a steady increase in the size of the heated water in the lake during summer months. Pet. at 9-10.

SIPC explains that changes in local weather conditions also have an effect on Lake of Egypt's ability to dissipate heat. Pet. at 10. Prolonged droughts, elevated air temperatures, and high humidity are listed as weather conditions that have a negative impact on the lake's ability to cool Marion Station's discharge water. *Id*.

The northern portion of Lake of Egypt lies in Williamson County while the southern portion is located in Johnson County. Marion Station, in Williamson County, is located on the northwest bank of the lake. The Saline River flows from south to north in the area of Lake of Egypt, therefore the dam, like Marion Station, is located at the north end of the 2,300 acre lake. Lake of Egypt has 93 miles of shoreline, an average depth of 18 feet and a maximum depth of 52 feet. Pet. at 8. Lake of Egypt is approximately 6.2 miles in length from Marion Station and the dam at the northern end to the southern, upstream end. Pet. Exh. B at 25. AMEC conducted a bathymetry study of the lower portion of the lake in 2010. *Id*. That study revealed that, while "[e]xtensive areas of water 25 to 40 feet deep are present in the main body of the lake," the cove into which Marion Station discharges, "primarily consists of water less than 20 feet in depth." *Id*. The discharge area is described as having a "very shallow fringe area (2 to 5 feet in depth) that surrounds a central channel with depths ranging from 10 to 25 feet." *Id*.

SIPC owns the land around the perimeter of Lake of Egypt up to the 50-year high water elevation. Pet. Exh. B at 2. However, Lake of Egypt is accessible to the public. Since its creation, Lake of Egypt has become a destination for recreational fishing and boating. Pet. at 8. According to SIPC's petition, for example, Pyramid Acres Marina hosted 34 fishing tournaments during the first part of 2014. *Id*. at 7. There are four public access points on the lake's shore including at least one in Shawnee National Forest. *Id*. at 8. In addition, Lake of Egypt serves as a source of drinking water. Union, Jackson, and Williamson Counties draw approximately one million gallons of drinking water per day from Lake of Egypt. Pet. at 8.

2003 Boiler Unit 123

As indicated above, SIPC has relied, in part, on studies conducted by SIUC on Lake of Egypt and the effects of thermal discharges into the lake. Pet. at 10; *supra* at 2. Those studies showed that the new boiler for Unit 123 beginning in 2003 changed the nature of Marion Station's thermal discharge. Pet. at 10. The thermal discharges increased both in volume and frequency at that time. The frequency of thermal discharge, however, increased dramatically. *Id*. In 2003, Unit 123, which operates at all times, replaced three, separate units (Unit 1, Unit 2, and Unit 3) that were operated primarily as peaker units during periods of high energy demand such as hot summer months and cold winter months. *Id*. Therefore, the discharge from Unit 123 occurs on a more regular basis whereas the discharge from the separate and smaller peaker units (Units 1, 2, and 3) was seasonal.

SIPC and AMEC stress the importance of the 2003 change in the petition and the AMEC evaluation. *See* Pet. at 10; Pet. Exh. B at 3, 20, 21. For example, the AMEC evaluation frames the results of the only detailed biotic category study (on fish) in terms of "before and after the 2003 boiler replacement." Pet. Exh. B at 20.

NPDES Permit and Applicable Thermal Effluent Limits

Illinois EPA issued the current NPDES permit (No. IL0004316) (NPDES permit) for Marion Station on February 1, 2007 with an effective date of March 1, 2007. Pet. Exh. A at 1-2. The permit includes an expiration date of February 29, 2012.[1] *Id.* at 2. The thermal element of Marion Station's discharge is the condenser cooling water, at discharge outfall 003. Pet. Exh. A at 1, 3. The discharge includes not only condenser cooling water (229 Million Gallons per Day or MGD), but also auxiliary cooling water (0.4 MGD) and HVAC system discharge (0.4 MGD). *Id*. at 3. Special Condition 4 of the permit sets out the thermal effluent limits for Marion Station. Pet. Exh. A at 6. That condition states:

> Discharge of wastewater from this facility must not alone or in combination with other sources cause the receiving stream to violate the following thermal limitations at the edge of the mixing zone . . .
>
> A. Maximum temperature rise above natural temperature must not exceed 5 F (2.8 C).
>
> B. Water temperature at representative locations in the lake shall not exceed the maximum limits in the following table during more than one (1) percent of the hours in the 12-month period ending with any month. Moreover, at no time shall the water temperature at such locations exceed the maximum limits in the following table by more than 3 F (1.7 C).

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
60 (16)	60 (16)	60 (16)	90 (32)	90 (32)	90 (32)	90 (32)	90 (32)	90 (32)	90 (32)	90 (32)	60 (16)

> C. The monthly maximum value shall be reported on the DMR [discharge monitoring report] form.
>
> D. The computer model, PDS program, shall be used to predict plume trajectory and the area enclosed by the surface isotherms to determine compliance with the above temperature limitations. *Id*.

[1] For purposes of this opinion and order, the Board assumes that SIPC initiated the NPDES permit renewal process "not later than 180 days prior to the expiration date" of February 29, 2012 so as to "receive authorization to discharge beyond the expiration date." *See* Pet. Exh. A at 1. In support of this assumption, the Board notes that AMEC's evaluation was prepared in preparation for NPDES permit renewal as well as in support of this thermal demonstration, though the date on the AMEC evaluation is later in time than the NPDES permit's expiration date.

Special Condition 7 also addresses the thermal element of SIPC's discharge, stating,

> [d]ue to increase in thermal discharge volume [SIPC] shall comply with Section 302.211f of Title 35, Chapter 1, Subtitle C: Water Pollution Regulations and Section 316(a) of the CWA by demonstrating that thermal discharge from Marion Generating Station will not cause and cannot reasonably be expected to cause significant ecological damage to Lake of Egypt. Pet. Exh. A at 6.

The permit refers to Section 302.211 of the Board's water pollution regulations for the definition of the mixing zone in Lake of Egypt. Pet. Exh. A at 6. SIPC asserts that it has not "participated in any prior thermal proceeding" before the Board and did not provide information about prior provisional variances as a part of its petition. Pet. at 40.

Temperature

Two collections of temperature data were considered in AMEC's evaluation supporting SIPC's petition. First, surface temperature data were collected in mid-June, early August, and early September 2006. Pet. Exh. B at 24. In addition to considering the surface temperature, AMEC also considered the 5° F above natural, or ambient temperature of the water, consistent with Special Condition 4 of SIPC's NPDES permit. The area of Lake of Egypt with temperatures exceeding 5° F above ambient temperature in mid-June 2006 was limited to 4.5-acre area entirely within the 26-acre mixing zone at the SIPC discharge. *Id*. Temperatures at the edge of the mixing zone were approximately 84° F, and elsewhere on Lake of Egypt, surface temperatures were well below the permitted maximum of 90° F. *Id*.; *see* Pet. Exh. A at 6.

Early August 2006 surface temperatures exceeded the 5° F above ambient temperature limit over approximately 80 acres of Lake of Egypt. Pet. Exh. B at 24. Surface temperature at the edge of the mixing zone was 98° F, and surface temperatures were above 95° F elsewhere in the lake. *Id*. In early September 2006, surface waters had cooled a bit so that the surface area exceeding 5° F above ambient temperature was approximately 63 acres. *Id*. Surface temperatures at the edge of the mixing zone ranged from 90° to 92° F and temperatures at the intake cove and across the lake from the discharge had decreased to the mid-80°s. *Id*.

The second set of temperature data were collected at the surface and at different depths in the water table in July and August 2010, simultaneously with fish surveys. Pet. Exh. B at 24. Surface temperatures were taken on July 14, 2010 and included 98° F at the discharge point and 94° F at the eastern edge of the mixing zone. *Id*. Surface temperatures in the lower portion of Lake of Egypt, but outside of the mixing zone "decreased to the upper 80s in the intake cove." *Id*. Surface temperatures were generally at or above 90° F elsewhere in the lower lake. *Id*. The following table shows temperature data, sorted by date, depth in the water column, and electrofishing station collected during the summer of 2010.

		July 22, 2010		Aug. 17, 2010	
	Station #	2 feet depth	8 feet depth	2 feet depth	8 feet depth
Lower Lake	1	94.3° F	94.1° F	90.1° F	88.3° F
	2	94.3° F	94.3° F	94.5° F	88.9° F
	3	93.9° F	93.0° F	100.6° F	93.0° F
	4	93.4° F	91.9° F	95.9° F	92.8° F
	5	92.3° F	90.9° F	95.9° F	89.1° F
Upper Lake	6	88.2° F	88.2° F	87.8° F	87.6° F
	7	87.4° F	86.9° F	88.5° F	87.3° F
	8	88.0° F	85.3° F	88.5° F	86.4° F
	9	87.3° F	87.4° F	88.2° F	87.4° F

Pet. Exh. B at 25.

PROPOSED ALTERNATIVE THERMAL EFFLUENT LIMITATIONS

In its petition, SIPC argues that "[t]here are no applicable effluent limitations for temperature" and that some of Illinois' general use water quality standards do not apply to the Lake of Egypt. Pet. at 11. Citing Board of Trustees of Southern Illinois University Governing Southern Illinois University, Edwardsville v. IEPA, PCB 02-105, slip op. at 13 (Aug. 4, 2005), SIPC states that the Board has found "seasonal temperature limits found in Section 302.211(e)" not applicable to lakes and, therefore, Special Condition 4(b) should not be included in SIPC's renewed NPDES permit. *Id*. Reading Special Condition 4(b) out of its renewed NPDES permit, SIPC requests the following thermal effluent limitations in place of the remaining temperature provisions of its NPDES permit:

> In lieu of the temperature water quality standards defined by Section 302.211, the thermal discharge to Lake of Egypt from SIPC's Marion Generating Station shall not exceed the following maximum temperatures, measured at the outside edge of the 26-acre mixing zone in Lake of Egypt, by more than 1 percent of the hours in a 12-month period:
>
> 1. 72°F from December through March;
>
> 2. 90°F from April through May;
>
> 3. 101°F from June through September; and
>
> 4. 91°F from October through November.
>
> At no time shall the water temperature at the edge of the mixing zone exceed these maximums by more than 3°F. Pet. at 5.

ILLINIOS EPA RECOMMENDATION AND SIPC RESPONSE

Illinois EPA recommends the Board grant SIPC's requested relief, subject to conditions. Rec. at 4. Illinois EPA agreed with SIPC that, aside from the recommended conditions described below, "current effluent limitations are more stringent than necessary and that the requested alternative thermal requirements can assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the Lake of Egypt into which the heated effluent is discharged from the Marion Station." *Id.* at 9-10.

Illinois EPA Recommended Conditions

First, Illinois EPA finds that, while Petitioner considered all the biotic categories set out in the USEPA Guidance as being of low potential impact, SIPC "provided inadequate justification for this determination." Rec. at 5. Illinois EPA's first recommended condition, therefore, asks the Board to require SIPC to study the biotic categories of phytoplankton, zooplankton and meroplankton, habitat formers, and shellfish/macroinvertebrates. *Id*. at 4-5. Alternatively, Illinois EPA suggests that SIPC could provide additional justification for the low impact determination. *Id*. at 5. The Illinois EPA points out that, "[n]o site-specific data were provided for these other biotic categories," and "organisms from these other [biotic categories] may be important in sustaining the fishery and should not be assumed to be of low impact." *Id*.

Second, Illinois EPA recommended that SIPC study additional RIS as a part of its thermal demonstration. In its petition, SIPC includes consideration of recreationally important species and species necessary in the food chain, but failed to study thermally sensitive species and species potentially capable of becoming a localized nuisance. In the recommendation, Illinois EPA states that, while white and black crappie were considered by SIPC as recreationally important, those species "may be considered 'thermally sensitive' and the continued study of these species by [SIPC] would fulfill this [thermally sensitive species] RIS category. Rec. 5-6. Regarding potential nuisance species, Illinois EPA states, "Petitioner has not attempted to assess nuisance species within Lake of Egypt and provides no assurance that increased thermal loadings will not lead to an increase in nuisance species." *Id*. at 6. Illinois EPA suggests that a study of common carp, "and whether thermal loadings may lead to this species becoming a localized nuisance" in Lake of Egypt may satisfy this RIS.

Third, Illinois EPA recommended that the Board require SIPC to study the "impact of thermal loadings on white and black crappies within Lake of Egypt." Rec. at 7. In support of this recommended condition, Illinois EPA states that SIPC's petition lacks support for the conclusion that white and black crappie are unharmed by the thermal loadings to Lake of Egypt since 2003. Illinois EPA found that in review of Appendix C to Exhibit B of SIPC's petition, white and black crappie may be unable to take refuge from increased water temperatures because dissolved oxygen concentrations below the thermocline [where those fishes would naturally take refuge] were too low. *Id*. at 8; *see* Pet. Exh. B, Appendix C. In its recommendation, Illinois EPA makes specific suggestions on the types of studies that may satisfy this recommended condition. *Id*. at 9.

SIPC Response to Illinois EPA Recommendation

On July 17, 2014, SIPC filed its response to the Illinois EPA's recommendation, stating generally that "SIPC agrees to IEPA's proposed conditions." Res. at 2. With regard to Illinois EPA's first recommended condition, SIPC stated that AMEC "relied upon prior studies at Lake Sangchris, Newton Lake, and studies by SIUC to determine that Lake of Egypt is a site of low potential impact for [phytoplankton, zooplankton and meroplankton, habitat formers, shellfish and macroinvertebrates, and other wildlife]." *Id*. SIPC agreed to perform pilot field studies to determine whether "the site is one of low impact" and "to determine whether sampling or studies are necessary." *Id*. 2-3.

Regarding Illinois EPA's recommended condition that SIPC change its study of RIS, SIPC agreed to Illinois EPA's recommendation. *Id*. at 3-4. Rather than study white and black crappies as recreationally important species, SIPC will study the fishes as RIS for thermal sensitivity. *Id*. at 3. Additionally, SIPC agreed to study common carp as a nuisance species using the same sampling gear from prior studies "to allow for more effective temporal comparison" in Lake of Egypt. *Id*. at 3-4. Finally, SIPC stated that it wanted additional time to discuss a study in response to Illinois EPA's third recommended condition. *Id*. at 4. SIPC indicated that the "narrow range of crappie catch rates" was not sufficient to conclude that crappie populations have shifted since installation of the boiler in 2003. *Id*.

LEGAL BACKGROUND

The federal Clean Water Act (CWA) makes it unlawful for any person to discharge a pollutant from a point source into waters of the United States without a permit. 33 U.S.C. § 1311(a). Heat is a pollutant and thus heated discharges are regulated under the CWA. 33 U.S.C. § 1362(6). In general, discharge limitations in a permit are technology-based or water-quality based. 33 U.S.C. § 1311(b). Technology-based effluent limits generally are developed for an industry and reflect the "best available technology economically achievable." 33 U.S.C. § 1311(b)(2)(A); *see e.g.*, 40 C.F.R. Parts 405-471.

Water quality-based effluent limits ensure that water quality standards are met regardless of technology or economics considered in establishing technology-based limits. Water quality-based effluent limits are defined as "any more stringent limitation, including those necessary to meet water quality standards, treatment standards, or schedules of compliance, established pursuant to any State law or regulations . . . or any other Federal law or regulation, or required to implement any applicable water quality standard." 33 U.S.C. § 1311(b)(1)(C).

Accordingly, if a discharge from a point source interferes with attainment or maintenance of a water quality standard, an effluent limitation is established for that discharge notwithstanding any other technology-based standard. 33 U.S.C. §§ 1311(b)(1)(C), 1312(a); *see also* 35 Ill. Adm. Code 304.105. Water quality standards are set under authority provided in CWA Section 303. 33 U.S.C. § 1313. Illinois law authorizes the Board to adopt water quality standards, including thermal standards. 415 ILCS 5/13 (2012). The Board has done so, and the Board's water quality temperature standards for general use waters are found at 35 Ill. Adm. Code 302.211. In addition, the Board has set site-specific temperature limits at 35 Ill. Adm.

Code 303.Subpart C. Lake of Egypt, however, is not the subject of site-specific temperature limits.

Since the 1972 passage of the CWA, Section 316(a) has allowed a point source with thermal discharge to obtain relief from otherwise applicable thermal effluent limitations. Specifically, CWA Section 316(a) provides:

> With respect to any point source otherwise subject to the provisions of section 1311 of this title or section 1316 of this title, whenever the owner or operator of any such source, after opportunity for public hearing, can demonstrate to the satisfaction of the Administrator (or, if appropriate, the State) that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the projection [sic] and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made, the Administrator (or, if appropriate, the State) may impose an effluent limitation under such sections for such plant, with respect to the thermal component of such discharge (taking into account the interaction of such thermal component with other pollutants), that will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on that body of water. 33 U.S.C. § 1326.

Accordingly, Section 304.141(c) [2] of the Board's rules provides:

> The standards of this Chapter shall apply to thermal discharges unless, after public notice and opportunity for public hearing, in accordance with section 316 of the CWA, and applicable federal regulations, and procedures in 35 Ill. Adm. Code 106.Subpart K, the Board has determined that different standards shall apply to a particular thermal discharge. 35 Ill. Adm. Code 304.141(c).

Thus, under CWA Section 316(a) and 35 Ill. Adm. Code 304.141(c), the Board may establish an alternative thermal effluent limitation based on a demonstration that the alternative limit will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in the receiving water. Such establishment of alternative thermal effluent limitations is not a water quality standard change.

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[2] The Board originally adopted 35 Ill. Adm. Code 304.141(c) as Rule 410(c) of Chapter 3 of the Board's Water Pollution Regulations on August 29, 1974:

> The standards of Chapter 3 shall apply to thermal discharges unless, after public notice and opportunity for public hearing, in accordance with Section 316 of the [Federal Water Pollution Control Act] and applicable federal regulations, the Administrator and the Board have determined that different standards shall apply to a particular thermal discharge.

In 1977, USEPA issued draft guidance on CWA Section 316(a) demonstrations in "Interagency 316(a) Technical Guidance Manual and Guide for Thermal Effects Sections of Nuclear Facilities Environmental Impact Statements (DRAFT)" dated May 1, 1977 (Draft 316(a) Manual). The Draft 316(a) Manual provides that it "is intended to be used as a general guidance and as a starting point for discussions," and that delegated state agencies "are not rigidly bound by the contents of this document." Draft 316(a) Manual at 8-9. This guidance has not been finalized and remains a draft. Nevertheless, the Board finds the decision criteria in the Draft 316(a) Manual useful in its analysis. The Board also notes that Section 106.1120 of its procedural rules requires a petitioner seeking alternative thermal effluent relief to consider guidance published by USEPA in making its demonstration. *See* 35 Ill. Adm. Code 106.1120(e). In 1979, USEPA promulgated rules implementing CWA Section 316(a) which are codified at 40 C.F.R. § 125.Subpart H.

BURDEN OF PROOF

The burden of proof is on SIPC to demonstrate that the applicable thermal effluent limitation found in its NPDES permit, and based on those found at 35 Ill. Adm. Code 302.211, is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the receiving water, specifically Lake of Egypt. *See* 35 Ill. Adm. Code 106.1160(a), (b). SIPC must also demonstrate that the requested alternative thermal effluent limitation assures the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in the receiving water. *See* 35 Ill. Adm. Code 106.1160(c). SIPC's demonstration must consider the cumulative impact of its thermal discharge together with all other significant impacts on the species affected. *Id.* This demonstration may be referred to as a prospective demonstration.

An existing discharger, such as SIPC's Marion Station, may base its demonstration that its proposed alternate limit is sufficiently protective on the absence of prior appreciable harm instead of using predictive studies. This demonstration may be referred to as a retrospective demonstration. Such a demonstration must show either:

> (A) That no appreciable harm has resulted from the normal component of the discharge, taking into account the interaction of such thermal component with other pollutants and the additive effect of other thermal sources . . . ; or
>
> (B) That despite the occurrence of such previous harm, the desired alternative thermal effluent limitation (or appropriate modifications thereof) will nevertheless assure the protection and propagation of a balanced and indigenous population . . . . 35 Ill. Adm. Code 106.1160(d)(1)(A), (B); *see also* 40 C.F.R. § 125.73(c).

In its petition, SIPC asserts that as an existing discharger without the intent to increase or intensify its discharge, "SIPC can rely on the absence of prior appreciable harm in lieu of predictive studies to show that the station's thermal discharges will assure the protection and propagation of a balanced, indigenous community of shellfish, fish, and wildlife in and on Lake

of Egypt." Pet. at 15-16. SIPC, however, conducted a predictive study due to the "potential for 'stressed conditions,'" in Lake of Egypt. *Id*. at 17. AMEC describes its evaluation as "a combination of predictive and empirical (i.e., retrospective) assessment methods and data to analyze the biological effects of the proposed thermal limits." Accordingly, SIPC describes its demonstration as addressing whether prior operations caused appreciable harm and considering predictive future effects of the requested alternate limit. *Id.* at 16-17.

BOARD DISCUSSION

As explained above, SIPC must demonstrate that the current standard is more stringent than necessary to assure, and the requested alternative limit will assure, the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in Lake of Egypt. *See* 33 U.S.C. § 1326(a). The Draft 316(a) Manual sets forth the main components for such demonstrations: (1) biotic category analysis; (2) representative important species analysis; and (3) master rationale for the proposed alternate limit.

Biotic Category Analysis

The starting point in a CWA Section 316(a) demonstration is the early screening process to identify the balanced, indigenous population of aquatic life in the receiving water. Draft 316(a) Manual at 33. The CWA uses the phrase "balanced, indigenous population" (BIP) and the federal regulations define the phrase "balanced, indigenous community" (BIC). These phrases have come to be synonymous and mean

> a biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species, and by a lack of domination by pollution tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications. Normally, however, such a community will not include species whose presence or abundance is attributable to the introduction of pollutants that will be eliminated by compliance by all sources with section 301(b)(2) of the CWA; and may not include species whose presence or abundance is attributable to alternative thermal effluent limitations imposed pursuant to this Subpart or through regulatory relief from otherwise applicable thermal limitations under Chapter I of Subtitle C or standards granted by the Board. 35 Ill. Adm. Code 106.1110; *see also* 40 C.F.R. § 125.71(c).

Biotic communities may contain numerous species, and, as a result, USEPA suggests an assessment of thermal impacts on a community-by-community basis. The Draft 316(a) Manual identifies the following biotic categories: habitat formers, phytoplankton, zooplankton, macroinvertebrates and shellfish, fish, and other vertebrate wildlife. Draft 316(a) Manual at 18-32. After completing the early screening process and making a preliminary assessment of the amount of additional work needed in each biotic category, the applicant chooses the demonstration type most appropriate for the site. *Id.* at 33.

A CWA Section 316(a) demonstration describes the impact of the thermal discharge on each biotic category. The applicant must present data justifying the conclusions reached for each biotic category. Draft 316(a) Manual at 16. If a site is a low potential impact area for a biotic category, "it would be unnecessary to conduct detailed studies to give the taxonomic identification of every species of [the biotic category] in the vicinity." *Id.* at 6. Rather, the applicant needs to complete a brief description of the thermal impact on the biotic category. *See id.* at 14, 33. For biotic categories that are not of low potential impact, the applicant must conduct a more comprehensive analysis. *Id.* at 15, 33.

For a CWA Section 316(a) demonstration to be successful, the demonstration must show that each biotic category meets specified decision criteria. Draft 316(a) Manual at 16. The Draft 316(a) Manual sets forth decision criteria for each biotic category. The demonstration must show that impacts to each biotic category are sufficiently inconsequential that the protection and propagation of the balanced, indigenous community will be assured. *Id.* at 34. In this section, the Board discusses the decision criteria before discussing how SIPC addressed each biotic category.

Generally, SIPC states that "AMEC determined that Lake of Egypt meets the criteria set forth in USEPA guidance as a site of low potential impact for phytoplankton, zooplankton and meroplankton, habitat formers, shellfish and macroinvertebrates, and other wildlife." Pet. at 30. This leaves only fish, according to SIPC, as a biotic category requiring a detailed assessment. Pet. at 32.

Habitat Formers (Aquatic Vegetation)

Habitat formers are the plants providing cover, foraging, spawning, or nursery habitat for fish and shellfish. Draft 316(a) Manual at 76-77. The Draft 316(a) Manual defines low potential impact areas as areas devoid of habitat formers due to low levels of nutrients, inadequate light, sedimentation, scouring stream velocities, substrate character, or toxic materials. *Id.* at 22. The Draft 316(a) Manual provides that a CWA Section 316(a) demonstration is successful if the applicant shows either the site is a low potential impact area for habitat formers or: (i) the heated discharge will not result in deterioration of habitat formers so as to cause appreciable harm to the balanced, indigenous community; and (ii) heated discharge will not have an adverse impact on threatened or endangered species as a result of impact on habitat formers. *Id.* In addition, a request may be denied if there is any probable thermal elimination of habitat formers or if important fish, shellfish, or wildlife are thermally excluded from use of the habitat. *Id.*

In its petition, SIPC states that the AMEC evaluation found that field reports beginning in 2006 were "comparable to historical reports" showing a "lack of deterioration of the habitat formers community." Pet. at 31. AMEC found that rooted aquatic macrophytes were the only organisms characteristic of this biotic category in or on Lake of Egypt. Pet. Exh. B at 18. AMEC also states that "[n]o systematic studies of aquatic vegetation have been performed on Lake of Egypt." *Id.* Instead, AMEC referenced a study of the upper Illinois River drainage basin where it was found that communities of habitat formers in warmer areas "were not impaired in comparison to the sampled communities in cooler areas" of the basin. *Id.* AMEC acknowledges that aquatic macrophytes are supported by downstream portions of Lake of Egypt,

near the Marion Station's discharge. A thriving macrophyte community in this location, "suggest that the thermal effluent has not and will not result in the deterioration of the aquatic macrophyte community." *Id.*

AMEC describes the importance of this biotic category as a nutrient source for small fish or foraging species. AMEC concludes that because the population of small fish and foraging species has remained stable since the establishment of the Lake of Egypt, "it is reasonable to conclude that there has not been a deterioration of the habitat former community." *Id.* AMEC also contends that there are no threatened or endangered species of fish present in Lake of Egypt, therefore, even if the habitat formers community was negatively impacted by the thermal discharge, there would be no effect on species of concern. *Id.*

The Board finds that a thriving macrophyte community near the Marion Station's discharge distinguishes this biotic category from one of low potential impact. Section 3.3.3.2 of the Draft 316(a) Manual provides that aquatic environments "devoid of habitat formers" may be considered a low potential impact area. Draft 316(a) Manual at 22. The Board also finds that SIPC provided no site-specific studies on Lake of Egypt, but instead relied on a study from the Illinois River basin to make the low potential impact determination. Finally, the Board finds that SIPC failed to address whether there is any probability of "thermal elimination of habitat formers" or "if important fish, shellfish, or wildlife [would be] thermally excluded from use of the habitat" under the requested alternative thermal effluent limitation. Draft 316(a) Manual at 22. For these reasons, the Board finds that SIPC failed to provide support for its determination that any effect of the thermal discharge on Lake of Egypt will be sufficiently inconsequential that the protection and propagation of the habitat formers and aquatic vegetation community will be assured.

Phytoplankton

Phytoplankton are microscopic plants, such as algae, transported by water current. Phytoplankton are a food source for zooplankton and fish. Draft 316(a) Manual at 55. The Draft 316(a) Manual defines areas of low potential impact for phytoplankton as including ecosystems where phytoplankton are not the food chain base, for example, an ecosystem in which the food web is based on detrital material. *Id.* at 18-19. An area is not considered as low potential impact for phytoplankton if: (a) phytoplankton contribute a substantial amount of the primary synthetic activity supporting the community; (b) a shift toward nuisance species may be encouraged by the thermal discharge; or (c) the thermal discharge may alter the community from detrital to phytoplankton-based system. *Id.* at 19. The Draft 316(a) Manual provides that a CWA Section 316(a) demonstration is successful if the applicant shows either the site is a low potential impact area for phytoplankton or if the applicant shows: (i) a shift toward nuisance phytoplankton is not likely; (ii) little likelihood of altering the community from detrital to phytoplankton-based system; and (iii) appreciable harm to the community is not likely to occur as a result of phytoplankton changes. *Id.* at 18.

In the petition, SIPC states that the fact that there have been "no recent occurrences of algal blooms on the Lake of Egypt" suggests that the Lake of Egypt is not prone to shift toward a predominance of nuisance phytoplankton. Pet. at 30. SIPC argues that historical algal blooms

were due to the mismanagement of wastewater by the nearby municipality of Goreville and the homes surrounding Lake of Egypt. SIPC cites to the lack of algal blooms since a change in wastewater management practices to support its position that the phytoplankton biotic category is one of low potential impact at Lake of Egypt. *Id.*

In the AMEC evaluation, Lake of Egypt is described as "an open water impounded lacustrine system . . . that has a phytoplankton-based food web." Pet. Exh. B at 15. AMEC specifies that "[n]o studies specific to phytoplankton have been performed on Lake of Egypt." *Id*. Rather than site-specific studies, AMEC relied upon studies of Lake Sangchris and Newton Lake to support its conclusion that Lake of Egypt is low potential impact for phytoplankton. *Id.* at 16. AMEC reasons that "[t]he resident community in the Lake of Egypt has developed under the environmental conditions . . . that are similar to the conditions that will persist in the future, and there has thus far been no indication of phytoplankton community impairment." *Id*.

The Draft 316(a) Manual provides "[a]reas of low potential impact for phytoplankton are defined as open ocean areas or systems in which phytoplankton is *not* the food chain base." Draft 316(a) Manual at 18, emphasis added. The Board finds that, because the AMEC evaluation explicitly states that Lake of Egypt has a phytoplankton-based food web, and the record lacks information to the contrary, Lake of Egypt may not be considered as low potential impact for phytoplankton. The Board also finds that while SIPC asserts that no algal blooms have occurred since the change in wastewater management in areas surrounding the Lake of Egypt, the petition lacks support for the other two necessary findings: that there is little likelihood of altering the community from detrital to phytoplankton-based system; and appreciable harm to the community is not likely to occur as a result of phytoplankton changes. Therefore, the Board finds that SIPC's petition has failed to show that the effect of the thermal discharge is sufficiently inconsequential that the protection and propagation of the phytoplankton community will be assured.

Zooplankton

Zooplankton are animal microorganisms that live unattached in the water column and drift with water current. Zooplankton are a food source for larval fish and shellfish. Draft 316(a) Manual at 56. The Draft 316(a) Manual defines areas of low potential impact for zooplankton as areas with low concentrations of species that are commercially important, rare, endangered, or important components of the food web, or as areas where the thermal discharge will affect a relatively small portion of the receiving water. *Id.* at 20-21. The Draft 316(a) Manual provides that a CWA Section 316(a) demonstration is successful if the applicant shows either the site is a low potential impact area for zooplankton or if the applicant shows: (i) changes in zooplankton will not result in appreciable harm to the balanced, indigenous community; (ii) the heated discharge is not likely to alter the standing crop or relative abundance; and (iii) the thermal plume does not constitute a lethal barrier to free movement of zooplankton. *Id.* at 20.

In the petition, SIPC argued that the Lake of Egypt's size, depth, and shape are assets of the lake that benefit zooplankton. Pet. at 31. SIPC states that, "AMEC explained that the thermal plume does not constitute a lethal barrier to the free movement of species" in the

zooplankton category in part because the thermal discharge is located at the north end of the lake. *Id*. SIPC asserts that the location of the thermal discharge minimizes "potential negative effects of the thermal plume constituting a barrier or attractant to the free movement of [zooplankton] throughout the lake." *Id*. Likewise, the AMEC evaluation asserts that if there were any temporary effects on the zooplankton community due to the thermal discharge, "there are extensive areas outside the zone of thermal influence that could act as either refugia or sources of recolonization potential." Pet. Exh. B at 17. The AMEC evaluation states that any effect on zooplankton would likely be limited to the mixing zone. *Id*.

As with the biotic categories above, like habitat formers and phytoplankton, AMEC states that "no studies of the zooplankton or meroplankton communities have been performed on Lake of Egypt." The AMEC evaluation instead relies on studies of similar cooling lakes in Illinois to support its conclusion that Lake of Egypt is a water body of low potential impact for zooplankton. Pet. Exh. B at 17. Specifically, AMEC references studies on Lake Sangchris and Lake Shelbyville in support of its position that, while thermal loading was associated with a decrease in biomass and abundance, the thermal discharge in Lake Sangchris "enhanced zooplankton communities during autumn, winter and spring." *Id*. In Newton Lake, on the other hand, AMEC found that zooplankton densities varied widely in the lake but the densities were not correlated with water temperatures. *Id*. AMEC acknowledges that zooplankton are a food source for many fish, but argues that the stable fish community in the Lake of Egypt suggests that zooplankton, as a food source for fish, "have not been appreciably harmed by the thermal discharge." *Id*.

In contrast to the first criterion for a low potential impact water for zooplankton (*i.e.*, areas with low concentrations of species that are commercially important, rare, endangered, or important components of the food web) the AMEC evaluation states that Lake of Egypt contains recreationally and commercially important species. SIPC's petition also characterizes Lake of Egypt as a "vibrant recreational resource for public use" based largely on the recreational fishing that takes place through the year. Pet. at 38-39. Therefore, the Board finds that SIPC's petition lacks support for a determination that Lake of Egypt is of low potential impact for the zooplankton biotic category.

Further, the Board finds that SIPC's petition lacks support for finding that: changes in zooplankton will not result in appreciable harm to the balanced, indigenous community; the heated discharge is not likely to alter the standing crop or relative abundance; and the thermal plume does not constitute a lethal barrier to free movement of zooplankton. For all of these reasons, the Board concludes that SIPC's demonstration failed to show that impacts to zooplankton are sufficiently inconsequential that the protection and propagation of the zooplankton community will be assured.

Macroinvertebrates and Shellfish

Macroinvertebrates, including shellfish, are components of aquatic food webs as a source of food and as bait for fishers. The Draft 316(a) Manual defines areas of low potential impact as areas where macroinvertebrates are not present or are present in low numbers and do not serve as important components of the aquatic community, or as spawning or nursery areas for such

species. Draft 316(a) Manual at 25. The Draft 316(a) Manual provides that a CWA Section 316(a) demonstration is successful if the applicant shows either the site is a low potential impact area for macroinvertebrates and shellfish or if the applicant shows: (i) no appreciable harm to the balanced and indigenous community; (ii) critical functions of macroinvertebrates are being maintained as they existed prior to introduction of heat; (iii) invertebrates as a food source are not a factor limiting fish production or drifting invertebrates are not harmed by passage through thermal plume; and (iv) the discharge area does not include a spawning or nursery site for important shellfish and/or macroinvertebrates. *Id.* at 23-24.

SIPC characterizes Lake of Egypt as a water of low potential impact for shellfish and macroinvertebrates "because the area of thermal influence is very small in relation to the 2,300-acre lake." Pet. at 31. SIPC also asserts that there is "a deep hypolimnetic area in the vicinity of the thermal discharge" and there are no commercially or recreationally important shellfish or macroinvertebrates present. *Id*. AMEC explains that the hypolimnetic area "is less thermally affected than surface or near-surface waters." Pet. Exh. B at 19. AMEC asserts that even within the mixing zone, the thermal changes to the lake are mostly surficial. Temperatures in the deeper, benthic environment are not "markedly elevated" even when the remainder of the lake is experiencing stressed conditions.[3] *Id*.

The AMEC evaluation states that "no systematic studies of the shellfish or macroinvertebrate communities have been performed on Lake of Egypt." Pet. Exh. B at 19. Instead, AMEC bases its shellfish/macroinvertebrates biotic category determinations on similar impoundments in Illinois. *Id*. AMEC states that, based on the characteristics of these other impoundments, "there are no species of commercial or recreational value present in the lake." *Id*. AMEC lists some species recovered from Lake of Egypt during a 2007 impingement study including the Asiatic clam *Corbicula*, the crayfish *Orconectes*, and the grass shrimp *Palaemonetes*, however, according to AMEC none of these are endangered species. *Id*. The AMEC evaluation acknowledges that "macroinvertebrates likely serve as an important forage component in Lake of Egypt." However, AMEC also cites the healthy and abundant fish population as evidence that either the macroinvertebrate community is unaffected by the thermal discharge or the fish community does not rely on macroinvertebrates as a food source. *Id*. AMEC concludes its discussion on shellfish and macroinvertebrates by stating:

> The lack of a reduction in the abundance or diversity of shellfish and macroinvertebrates, and the absence of a barrier to the free movement of these organisms formed by the thermal plume combine to indicate that there has been, and will continue to be, no appreciable harm to the balanced indigenous community for this biotic category. Pet. Exh. B at 19.

The Board finds that SIPC's petition lacks support for the conclusion that Lake of Egypt should be considered as low potential impact for the shellfish/macroinvertebrates biotic category.

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[3] The record in this matter does not include a description of how or where the "deep hypolimnetic area in the vicinity of the thermal discharge" meets what SIPC describes elsewhere in the petition as a discharge area featuring a "very shallow fringe area (2 to 5 feet in depth) that surrounds a central channel with depths ranging from 10 to 25 feet." *See infra* at 6.

As noted above, the AMEC evaluation recognizes that macroinvertebrates likely serve as an important food source for other species in the lake. Pet. Exh. B at 19. In order for a water to be considered low potential impact for this biotic category, shellfish or macroinvertebrates cannot "serve as important components of the aquatic community." Draft 316(a) Manual at 25. Therefore, SIPC has failed to support a determination that Lake of Egypt is low potential impact for shellfish/macroinvertebrates.

Further, the Board finds that SIPC lacks scientific basis for the conclusion that there has been no reduction in the abundance or diversity of shellfish and macroinvertebrates. Other than the 2007 impingement study, SIPC's assessment of the shellfish/macroinvertebrate biotic category does not contain site-specific information in support of the low potential impact determination, or the more demanding determination under Section 3.3.4.1 of the Draft 316(a) Manual for sites not considered low potential impact. *See* Draft 316(a) Manual at 23. Further, SIPC's petition lacks the requisite continuity, from pre-2003 to the present, with regard to this biotic category to show that impacts to shellfish and macroinvertebrates are sufficiently inconsequential that the protection and propagation of that community will be assured.

Other Vertebrate Wildlife

"Other vertebrate wildlife" includes non-fish vertebrates such as ducks and geese. The Draft 316(a) Manual states that most sites in the United States will be considered to have low potential impact for other vertebrate wildlife because thermal plumes should not generally impact large or unique populations of wildlife. Draft 316(a) Manual at 32. The main exception is sites in cold areas where the thermal plume is predicted to attract geese and ducks and encourage them to stay through the winter. *Id.* The Draft 316(a) Manual provides that a CWA Section 316(a) demonstration is successful if the applicant shows either the site is a low potential impact area for other vertebrate wildlife or if the applicant shows that other wildlife will not suffer appreciable harm. *Id*.

In the petition, SIPC states that the observed use of Lake of Egypt by species such as Canada geese, red-tailed hawks, coyote, white-tailed deer, and rat snakes coupled with little impact to truly aquatic species supports a determination of low potential impact for this biotic category. Pet. at 32. AMEC again cited studies from other cooling lakes in Illinois, such as Lake Sangchris, which found that waterfowl showed no preference for areas of the water body influenced by a thermal discharge as compared to uninfluenced areas. Pet. Exh. B at 23. AMEC concludes that the lack of negative effects on truly aquatic species indicates that the thermal discharge into Lake of Egypt will not cause appreciable harm to other vertebrate wildlife. *Id*.

The Board finds that SIPC has demonstrated that Lake of Egypt should be considered as low potential impact for other vertebrate wildlife. The Draft 316(a) Manual sets an easier criterion test for this biotic category calling only for a brief site inspection and literature review. The AMEC evaluation documents these steps, and SIPC's demonstration is consistent with the Draft 316(a) Manual. Therefore, the Board finds that Lake of Egypt is low potential impact for the other vertebrate wildlife biotic category.

Fish

The Draft 316(a) Manual defines areas of low potential impact on fish as areas where the: (a) occurrence of sport and commercial species is marginal; (b) discharge site is not a spawning or nursery area; (c) thermal plume will not block or hinder fish migration; (d) thermal plume will not cause fish to be vulnerable to cold shock; and (e) thermal plume will not have an adverse impact on threatened or endangered species. Draft 316(a) Manual at 29. The Draft 316(a) Manual provides that a CWA Section 316(a) demonstration is successful if the applicant shows either the site is a low potential impact area for fish or if the applicant shows fish communities will not suffer appreciable harm from: (i) direct or indirect mortality from cold shock; (ii) direct or indirect mortality from excess heat; (iii) reduced reproductive success or growth as a result of heated discharge; (iv) exclusion from unacceptably large areas; or (v) blockage of migration. *Id.* at 28-29.

While SIPC states that "Lake of Egypt exhibits several characteristics indicative of a low potential impact area for fish," AMEC performed an in-depth study of fish due to the presence of sport and commercial species. Pet. at 32. As discussed below, the AMEC predictive study included selecting RIS as a measure of whether Lake of Egypt would sustain a balanced, indigenous community with the change in thermal discharge.

Board Finding on Biotic Category Analysis

SIPC, relying on the AMEC evaluation, considered Lake of Egypt as a low impact site for each biotic category except for fish. Pet. Exh. B at 15. In its recommendation, Illinois EPA found that SIPC, "provided inadequate justification for this determination. No site-specific data were provided for these other biotic categories as Petitioner only referenced studies from other Illinois reservoirs to support this justification." Rec. at 5. The Illinois EPA recommends that the Board grant SIPC the thermal relief requested with conditions mandating further study on the effects of the thermal discharge on the biotic categories identified in the Draft 316(a) Manual.

The Board, however, finds the Illinois EPA's recommendation of future study does not adequately meet the guidelines as set out in the Draft 316(a) Manual. The Draft 316(a) Manual recommends that "before embarking upon massive, comprehensive, baseline, field sampling," applicants first conduct pilot field studies and literature searches to determine "whether or not the site is one of low potential impact for individual biotic categories" and to determine "what additional studies will be required to develop biotic category rationales responsive to the decision criteria." Draft 316(a) Manual at 18.

SIPC's petition does not include sufficient information for a low potential impact determination for four of the six biotic categories on Lake of Egypt. The Board finds that SIPC met the burden for a low potential impact determination with regard to the other vertebrate wildlife biotic category. However, the Board finds that additional information is necessary to meet the decision criteria for low potential impact for the following four biotic categories: phytoplankton, zooplankton and meroplankton, habitat formers, and shellfish/ macroinvertebrates. Further, because SIPC provided insufficient information in support of such a determination, the Board finds that SIPC's demonstration lacks sufficient information to make

a successful criterion determination for a site *not* considered low potential impact for the other four biotic categories mentioned above.

Representative Important Species Analysis for Fish

As mentioned above, SIPC found that Lake of Egypt has many characteristics of a water body with low potential impact for the fish biotic category. Pet. at 32. Among those characteristics, SIPC found that: the area of Lake of Egypt receiving SIPC's discharge is not a unique spawning or nursery area for fish; the discharge affects a small portion of the Lake of Egypt and therefore does not impede migration of fish; the discharge will not cause fish to be subject to cold shock; and there is no evidence of endangered or threatened fish species. *Id*. Despite these findings, SIPC did not categorize Lake of Egypt as low potential impact for fish. SIPC conducted further study on fish, including the selection of RIS, due to the "greater than marginal" occurrence of sport and commercial species. *Id*.

A CWA Section 316(a) demonstration must identify the RIS for further study. "Representative important species" or "RIS" means

> species that are representative, in terms of their biological needs, of a balanced, indigenous community of shellfish, fish, and wildlife in the body of water into which a discharge of heat is made. 35 Ill. Adm. Code 106.1110; *see also* 40 C.F.R. § 125.71(b).[4]

RIS are selected from any combination of the following biotic categories: shellfish, fish, or habitat formers. Draft 316(a) Manual at 36. The Draft 316(a) Manual lists the following considerations in selecting RIS:

1. Species mentioned in state water quality standards;

2. Species identified in consultation with other governmental agencies;

3. Threatened or endangered species;

4. Thermally sensitive species;

5. Commercially or recreationally valuable species;

6. Far-field and indirect effects on entire water body; and

7. Critical to structure and function of ecological system. Draft 316(a) Manual at 37-38.

[4] *See supra* at 14 for the definition of "balanced indigenous community."

The Draft 316(a) Manual further provides:

> The most thermally sensitive species (and species group) in the local area should be identified and their importance should be given special consideration, since such species (or species groups) might be most readily eliminated from the community if effluent limitations allowed existing water temperatures to be altered. Consideration of the most sensitive species will best involve a total aquatic community viewpoint. Draft 316(a) Manual at 37.

In preparing a CWA Section 316(a) demonstration and underlying studies, federal and state agencies must be consulted to ensure that studies address appropriate wildlife. To this end, the Board's procedural rules require a petitioner to serve a copy of its petition on both Illinois EPA and Illinois DNR as well as requiring the petitioner to inform Illinois EPA of its proposed RIS list and supporting data and information. *See* 35 Ill. Adm. Code 106.1115(a)(4), 106.1120(b)(5), 106.1125. In addition, the Draft 316(a) Manual advises that the permitting authority:

> checks with the Regional Director of the [USFWS] and representatives of the [National Marine Fisheries Service] and States to make sure the study plan includes appropriate consideration of threatened or endangered species as well as other fish and wildlife resources. Draft 316(a) Manual at 15.

An applicant must collect thermal effects data for each RIS including: (i) high temperature survival for juveniles and adults; (ii) thermal shock tolerance; (iii) optimum temperature for growth; (iv) minimum and maximum temperatures for early development; (v) normal spawning dates and temperatures; and (vi) any special temperature requirements for reproduction. Draft 316(a) Manual at 43-45. A CWA Section 316(a) demonstration must show that RIS will not suffer appreciable harm from the heated discharge. *Id.* at 35.

Representative Important Species Selection

SIPC prefaces its discussion of the RIS selection and its detailed assessment of the fish biotic category by describing the fishery as the "most important biotic category in terms of economic importance and sensitivity to alternations (sic) in the thermal conditions of the lake." Pet. at 33. SIPC argues that fish surveys, both before and after the 2003 boiler installation, indicate a "healthy and self-sustaining" fish population that has been "stable over the past 12 to 13 years." *Id.* Much of the AMEC evaluation hinges on the pre/post 2003 analysis. *See supra* at 6.

AMEC selected seven fish species as RIS for Lake of Egypt. Pet. at 37. Those species were chosen as representative of two of the seven possible considerations listed in the Draft 316(a) Manual. Pet. at 37; Pet. Exh. B at 6; *see also* Draft 316(a) Manual at 37-38. AMEC chose threadfin shad, gizzard shad, channel catfish, bluegill, white and black crappies, and largemouth bass as commercially or recreationally important species. Pet. at 37; Pet. Exh. B at 6. AMEC chose threadfin shad and gizzard shad as "important prey species for largemouth bass." Pet. Exh. B at 6. In the petition, SIPC points out that "[w]hite and black crappies are

thermally sensitive species," but the AMEC evaluation does not appear to consider those species under the thermally sensitive species consideration. AMEC states that populations of gizzard shad, channel catfish, bluegill, largemouth bass, and threadfin shad were all either stocked or supplemented by stocking. *Id*. Currently, however, those species maintain a population by natural reproduction. *Id*.

Threadfin Shad

Threadfin shad was selected as a RIS due to what the AMEC evaluation describes as its crucial place in the Lake of Egypt's food web. Pet. Exh. B at 7. AMEC explains that threadfin shad do not lend themselves to electrofishing and other surveys because their shallow habitat and small size "make them less susceptible to the survey gears used." *Id*. Impingement surveys at the cooling water intake, however, detect threadfin shad as abundant in Lake of Egypt. *Id*. Threadfin shad are described as planktivorous and generally residing in the upper most five feet of water. Threadfin shad are sensitive to low temperatures and spawn between April and August when water temperatures are greater than 68°F. The AMEC study states that threadfin shad "[e]ggs hatch in three to six days, and develop into juveniles approximately two to three weeks later, depending on water temperature." *Id*.

Threadfin shad were included in all studies of fish in Lake of Egypt since 1997. Pet. Exh. B at 7. AMEC states that there is no clear evidence that the number of threadfin shad in Lake of Egypt has changed since the 2003 boiler replacement. *Id*. The 2010 electrofishing surveys revealed that while the size of threadfin shad was greater in the lower lake (closer to the discharge) numbers of the species were greater in the upper lake. *Id*.

Gizzard Shad

Gizzard shad was selected as a RIS because the young-of-year are an important food source for largemouth bass. Pet. Exh. B at 11. The species, therefore, holds a place in the food web of Lake of Egypt. *Id*. Gizzard shad is described as similar to threadfin shad in that it is planktivorous and it is generally found in shallow water. Gizzard shad reach sexual maturity in two to three years, spawn in April and May and its eggs hatch in two to seven days, depending on water temperature. *Id*.

Gizzard shad is also similar to threadfin shad in that it is not as susceptible to survey gears as larger fish. Pet. Exh. B at 12. Still, this species has been collected in every fish survey taken at Lake of Egypt since 1997. Again, AMEC states that there is "no clear evidence of any population change for this species since the 2003 boiler replacement." Pet. Exh. B at 12. Both the size and number of gizzard shad collected in the 2010 fish survey were greater in the upper lake as compared to the lower lake. *Id*.

Channel Catfish

Channel Catfish was selected as a RIS because it is prized as a game and food fish by the recreational fishing community around Lake of Egypt. Pet. Exh. B at 12. These fish move from the shallow waters near the bank of the lake or in debris over night to deeper water during the

daytime. Channel Catfish have been collected in all electrofishing surveys since 1997, but not in high numbers. *Id*. AMEC explains that this is due to Channel Catfish moving to deeper waters during the day when fish surveys occur. These fish spawn in water temperatures between 70° and 82° F. Channel Catfish eggs hatch in three to 10 days and the young remain larvae for 12 to 16 days. *Id*.

AMEC found that channel catfish numbers have not decreased in Lake of Egypt since 2003. Pet. Exh. B at 12. Instead, the 2010 electrofishing survey recovered more channel catfish than previous years. In 2010, a greater number of these fish were caught in the upper lake (away from the discharge and mixing zone) than in the lower lake, but AMEC explains that "electrofishing catch rates were low and do not support substantive conclusions about temporal or distributional patterns within the lake." *Id*.

Bluegill

Bluegill is described as an "important forage component" as a juvenile, and the "numerically dominant species" in Lake of Egypt as an adult. Pet. Exh. B at 12. It was chosen as a RIS due to both its value as a food source for largemouth bass and its value as a recreational fish. *Id*. According to AMEC, bluegill spawn in late May through August in waters between 67° and 80° F, though maximum spawning water temperature ranges between 82° and 93° F. Bluegill embryo require water below 93° F to survive. *Id*. Bluegill eggs hatch in approximately two days and the young exist as larvae for approximately 30 days. *Id*. at 12-13.

AMEC states that bluegill has consistently been the most abundant species recovered in fish surveys at Lake of Egypt. Pet. Exh. B at 13. While the population has varied, bluegill numbers have increased since the 2003 boiler installation. *Id*. at 11, 13. Catch rates for bluegill are similar at both the upper and lower portions of the lake.

Largemouth Bass

AMEC states that largemouth bass was selected as a RIS because they are highly sought after by sport fishermen in Lake of Egypt. Pet. Exh. B at 13. Largemouth bass have daily migration habits that take them from deeper water or water near cover during the daytime and into shallower water to feed during the night. *Id*. Largemouth bass spawn in water temperatures between 60° and 75°F, eggs hatch in three to four days, and the young remain larvae for approximately 19 days. *Id*.

The numbers of largemouth bass found in Lake of Egypt is variable, but the species was found in every fish survey conducted since 1997. Pet. Exh. B at 13. AMEC explains the variability by citing the small sample size taken with each fish survey and the recreational fishing demand of this species. AMEC argues that the catch rates do not indicate that the species has suffered as a result of the 2003 boiler installation, referencing similar survey results in 1997 and 2006. While the 2010 electrofishing catch rates "were nearly identical" in the lower lake and upper lake, the AMEC evaluation later indicates that the size of the largemouth bass caught in the lower lake was generally larger than those caught in the upper lake. Pet. Exh. B at 13, 22. Further, AMEC found that largemouth bass were found in greater numbers near the discharge

despite the higher water temperature in that area. *Id*. at 22. AMEC explains that the greater number of largemouth bass near the discharge may be due to the habitat of large riprap along the shoreline of the lake in this area. *Id*.

The largemouth bass caught as a result of the 2010 survey presented more abnormalities than any other fish species considered in the AMEC evaluation. AMEC stated that the abnormalities were likely due to recreational fisherman catching and releasing these fish. *Id.*

White and Black Crappie

White and black crappie were selected as a RIS because both species are sought after by recreational fisherman and "are species that are more thermally sensitive." Pet. Exh. B at 14. AMEC describes white crappie as being found in low-velocity, turbid waters, near submerged or bottom structures, of lakes and reservoirs larger than 5 acres. *Id*. Black crappie, on the other hand, prefers clearer waters of the same sort of water bodies. Lake of Egypt provides both habitats. White crappie spawn at temperatures between 60° and 68° F while black crappie prefer slightly warmer waters between 64° and 68° F. *Id*.

Lake of Egypt has been stocked with black crappie in 2008, 2009, and 2010. Pet. Exh. B at 14. While not dominating the fish population of Lake of Egypt, the population of both crappie species has varied over time with a low point in 1990 and 1998. AMEC explains that the variable population is due to: the relative small sample size of the fish surveys; recreational fishing pressure; and the cyclical nature of populations of these species in large reservoirs. In 2010 electrofishing surveys, AMEC found a considerably greater number of black crappie in the upper lake (away from the discharge and mixing zone) than in the lower lake. Pet. Exh. B at 22.

Board RIS Analysis

For the reasons below, the Board finds that, despite the information provided in the petition for the various species, SIPC has not considered all necessary RIS and not provided sufficient support for a conclusion that the selected RIS will not suffer appreciable harm. As stated in the Illinois EPA's recommendation, SIPC studied only two of the RIS categories listed in the Draft 316(a) Manual: recreationally important species and species necessary for the food chain. *See* Rec. at 5; Pet. Exh. B at 6. However, the Draft 316(a) Manual states

> The most thermally sensitive species (and species group) in the local area should be identified and their importance should be given special consideration, since such species (or species groups) might be most readily eliminated from the community if effluent limitations allowed existing water temperature to be altered. Draft 316(a) Manual at 37.

AMEC states that black and white crappie were selected as RIS due to their value as sportfish to the Lake of Egypt fishery and because of their thermal sensitivity. Pet. Exh. B at 14. Yet, the Board finds that the conclusions reached about survival of black and white crappie subjected to an altered thermal discharge are based on assumptions rather than information derived from site-specific studies on the crappie population in Lake of Egypt. AMEC cites to

data about ideal spawning temperatures for black and white crappie, but finds that the spawning periods for crappie varied between the upper lake and lower lake. Pet. Exh. B at 50. Further, AMEC acknowledges that spawning cycles of crappie have not been documented at Lake of Egypt, but "it is *likely* that spawning in the lower (heated) region of the lake is advanced relative to that in the upper (unheated) sections." *Id*. (emphasis added). Therefore, the AMEC evaluation reaches the conclusion that there is more than one spawning cycle for crappie in Lake of Egypt, but fails to indicate how or if the existence of two spawning cycles affects the crappie population of Lake of Egypt in any way.

The AMEC evaluation further states that, "[c]omplete life history, recruitment and growth information for crappie is relatively lacking within Lake of Egypt and potential direct inferences regarding thermal effects on recruitment are limited." Pet. Exh. B at 50. Referencing back to the two spawning cycles, mentioned above, AMEC concludes that the two spawning cycles are "*likely* to be supported by an accompanying productivity of organisms within lower trophic levels." *Id*. (emphasis added). AMEC then references the "apparent successful recruitment" of other species to conclude that if those other species have survived, there will be no thermal effect on black or white crappie. *Id*. There is no evidence in the record, however, that the other species listed are thermally sensitive species.

The Board agrees with Illinois EPA that SIPC must study a RIS as thermally sensitive in support of its petition for thermal variance. In its recommendation, Illinois EPA points out that the AMEC evaluation does not support SIPC's conclusion that crappie have been and will continue to be unharmed by the thermal loadings to Lake of Egypt that began in 2003. Rec. at 8. Illinois EPA notes the potential for summer water temperatures to exceed the temperatures tolerated by black and white crappie. Illinois EPA observes that, while refuge may exist for the species beneath the thermocline, dissolved oxygen concentrations at that depth of the lake are too low to be habitable. Rec. at 7-8. Consistent with the Draft 316(a) Manual, the Board finds that in the case of a discharger attempting to show that an increased thermal loading will not affect the balanced, indigenous community of a receiving water, special attention should be given to any RIS that are thermally sensitive.

In its response to the Illinois EPA recommendation, SIPC suggests studying the effects of the thermal loading on the common carp as a potential nuisance species. The Board agrees that studying carp as a nuisance species, regardless of carp's status as a RIS, would be valuable in light of the Draft 316(a) Manual's goal of protecting the balanced, indigenous population of Lake of Egypt. As pointed out by Illinois EPA, the catch rate data included in the AMEC evaluation show an increase in common carp catch rates since 2003. Pet. Exh. B at 11. Studying nuisance species in Lake of Egypt and their effect on species SIPC has selected as RIS and the indigenous community as a whole is consistent with USEPA's interpretation of CWA § 316(a). *See*, *e.g.* Public Service Company of Indiana, Inc. v. Wabash River Generating Station, USEPA Env. Appeals Bd. NPDES Appeal No. 78-6 (Nov. 29, 1979) ("§ 316(a) cannot be read to mean that a balanced indigenous population is maintained where the species composition . . . shifts from a riverine to a lake community or, as in this case, from thermally sensitive to thermally tolerant species."); *see also* 33 U.S.C. § 1326(a).

The Board finds that SIPC's RIS analysis does not provide a sufficiently clear assessment of the balanced indigenous community in Lake of Egypt. SIPC's petition does not contain adequate information to meet the decision criteria for a successful demonstration for the biotic categories of phytoplankton, zooplankton and meroplankton, habitat formers, shellfish and macroinvertebrates, and fish. The Board agrees with the Illinois EPA that SIPC must select additional RIS and conduct additional studies on the biotic categories and indigenous community to show that no appreciable harm will result to that community in Lake of Egypt.

Today's order does not reach the final step of a successful § 316(a) demonstration, the master rationale. Such an examination is unnecessary at this time because, as determined above, there is insufficient information in SIPC's biotic categories determination and RIS rationale to synthesize into a master ecosystem rationale to form "a convincing argument that the balanced, indigenous community will be protected." Draft 316(a) Manual at 52.

CONCLUSION

The Board finds that based on the record before it, SIPC has not demonstrated that the applicable thermal effluent limitation found in its NPDES permit is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the Lake of Egypt. Further, SIPC has not proven that the alternative discharge limitations proposed "will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on that body of water." 33 U.S.C. § 1326. Therefore, the Board denies SIPC's petition and closes the docket.

This opinion constitutes the Board's findings of fact and conclusions of law.

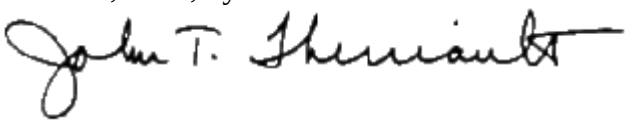
ORDER

SIPC is hereby denied alternate thermal effluent limitations requested in its petition dated May 13, 2014.

IT IS SO ORDERED.

Section 41(a) of the Act provides that final Board orders may be appealed directly to the Illinois Appellate Court within 35 days after the Board serves the order. 415 ILCS 5/41(a) (2012); *see also* 35 Ill. Adm. Code 101.300(d)(2), 101.906, 102.706. Illinois Supreme Court Rule 335 establishes filing requirements that apply when the Illinois Appellate Court, by statute, directly reviews administrative orders. 172 Ill. 2d R. 335. The Board's procedural rules provide that motions for the Board to reconsider or modify its final orders may be filed with the Board within 35 days after the order is received. 35 Ill. Adm. Code 101.520; *see also* 35 Ill. Adm. Code 101.902, 102.700, 102.702.

I, John T. Therriault, Clerk of the Illinois Pollution Control Board, certify that the Board adopted the above opinion and order on November 20, 2014, by a vote of 4 to 0.



John T. Therriault, Clerk
Illinois Pollution Control Board