UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW HAMPSHIRE

Sierra Club, Inc. and Conservation Law Foundation, Inc.

v.

Civil No. 19-cv-216-JL
Opinion No. 2023 DNH 149P

Granite Shore Power LLC; GSP Merrmack LLC; and Public Service Company of New Hampshire d/b/a Eversource Energy

ORDER AND VERDICT AFTER BENCH TRIAL

This case requires the court to assess a power plant's compliance with a National Pollutant Discharge Elimination System permit issued by the Environmental Protection Agency in 1992. After denying a motion to dismiss and two summary judgment motions, and partially denying a third summary judgment motion, the court conducted a bench trial on the remaining claims that spanned roughly fourteen days.

The plaintiffs and defendants each submitted a set of proposed findings and rulings and a trial brief before trial; the parties also jointly submitted a pre-trial statement of agreed facts. Following trial, the parties each filed post-trial briefs and re-filed their proposed findings and rulings with citations to the evidence in the record. With the assistance of these materials, the court makes the following findings of fact and rulings of law, see Fed. R. Civ. P. 52(a), resulting in judgment for the defendants on all five Counts.

I. Factual Background

The following findings of fact are generally drawn from the parties' statement of agreed facts[1] and, where indicated, the witness testimony adduced at trial or the documents admitted into evidence.

This lawsuit concerns the operation of Merrimack Station, a steam-electric power plant located in Bow, New Hampshire, on the western bank of the Merrimack River.[2] Before delving into the details of the lawsuit, the court begins with some background facts about the Station and its interaction with the surrounding water body.

Merrimack Station has two electrical generating units, referred to as Unit 1 and Unit 2.[3] When in operation, Merrimack Station draws water from the Merrimack River, which it uses to cool and condense the steam it produces while generating electricity.[4] The Station then discharges the heated water through a cooling canal back into the river.[5] The cooling canal contains Power Spray Modules which, in the EPA's words, "are designed to increase the evaporative cooling of the water in the canal and, thereby, to

[1] The agreed-to facts were submitted in the Joint Pretrial Submission of Agreed and Disputed Facts (doc. no. 93). Agreed-to facts are referred to as "AF" along with the associated paragraph number.

[2] Doc. no. 93 at AF ¶ 1.

[3] Id. at AF ¶ 2.

[4] Id. at AF ¶ 3.

[5] Id. at AF ¶ 5.

reduce the plant's ultimate thermal discharge into the river."[6] The Station's cooling system is referred to as a "once-through" or "open-cycle" cooling system.[7]

The Station releases heated water into the Hooksett Pool—a roughly 5.8-mile long section of the river that ranges between six and ten feet in depth.[8] The Hooksett Pool is bounded by two dams—the Garvins Fall Dam at the head of the pool, and the Hooksett Dam at the tail of the pool.[9] When released, the heated water forms a thermal "plume," or "an ever changing volume of water which has elevated temperature."[10] Thermal plumes released from the Station are surface-oriented, and may vary in depth.[11]

The EPA describes the potential effects of the addition of heat to the river as follows.

> Depending on the amount of heat being discharged and conditions in the receiving water, thermal discharges can have a variety of adverse ecological effects because aquatic organisms and water quality may be affected in many ways by water temperature. For example, fish have optimal temperatures for growth. They also display preferences for certain water temperatures and may, if possible, leave or

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[6] Id.

[7] Id. at AF ¶ 3.

[8] Id. at AF ¶¶ 3, 5.

[9] Id. at AF ¶ 6.

[10] Applied Science Associates, Inc., Modeling of Thermal Plume from Merrimack Station (Pls.' Ex. 14) at 2.

[11] See, e.g., id. at 3 (temperature readings gathered during "early spring until fall 2009" from "fixed thermistor strings that monitored the top, middle[,] and bottom water temperatures at west, center[,] and east locations at various transects (stations) along the [Merrimack] River" showed that "the observed elevated temperatures" from the Station's thermal plumes "were primarily contained between the west and center of the River in the top to middle of the water column and not . . . on the bottom"); Responses to Comments, Public Review of Merrimack Station NPDES Permit No. NH0001465 ("2020 Response to Comments") (Defs.' Ex. 9) at 246 (describing the "Station's surface-oriented thermal plume, which can hug the banks and extend down three-feet").

> avoid an area if water temperatures exceed their preferred levels. Furthermore, altered water temperatures may benefit certain species at the expense of other species, causing shifts in the make-up of the community of organisms in the affected water. Finally, increasing water temperatures can also affect water quality in many ways, such as by promoting algal growth or contributing to reduced levels of dissolved oxygen.[12]

The Federal Water Pollution Control Act, or the Clean Water Act, "established a National Pollution Discharge Elimination System ["NPDES"] . . . that is designed to prevent harmful discharges[,]" such as heat, "into the Nation's waters." Nat'l Ass'n of Home Builders v. Defenders of Wildlife, 551 U.S. 644, 650 (2007). Since 1992, the Station has operated under the same NPDES permit ("1992 Permit"), issued by the EPA pursuant to the CWA. The 1992 Permit authorizes the Station's discharge of heated water into the Merrimack River.[13]

Public Service Company of New Hampshire owned and operated Merrimack Station, and was subject to the Station's NPDES Permit, until 2018.[14] The defendant companies, GSP Merrimack LLC and Granite Shore Power LLC, were formed in 2017 for the purpose of purchasing Merrimack Station.[15] In January 2018, GSP Merrimack purchased and assumed operations of the Station, at which point the EPA transferred the

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[12] EPA -New England Clean Water Act NPDES permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station in Bow, New Hampshire NPDES permit No. NH 0001465 ("2011 Determinations Document") (Pls.' Ex. 3) at 4; see also infra Section III.D.1.

[13] Doc. no. 93 at AF ¶ 8.

[14] Id. at AF ¶ 9.

[15] Id. at AF ¶ 10. Granite Shore Power is the sole member of GSP Merrimack. Id. at AF ¶ 14.

operative 1992 Permit to GSP Merrimack.[16] In 2019, the plaintiffs, Sierra Club, Inc. and Conservation Law Foundation, Inc., two environmental organizations, filed the instant lawsuit under the citizen suit provision of the CWA, see 33 U.S.C. § 1365(a)(1). The plaintiffs allege that the defendants have violated, and are continuing to violate, the 1992 Permit.

Five claims remain, and were the subject of the bench trial. In Counts 1-3, the plaintiffs allege ongoing violations of each of the three elements of Part I.A.1.g of the 1992 Permit. Part I.A.1.g sets forth the following narrative thermal discharge limitation: "The combined thermal plumes for the station shall (a) not block zone of fish passage, (b) not change the balanced indigenous population of the receiving water, and (c) have minimal contact with the surrounding shorelines." In Count 4, the plaintiffs claim ongoing violations of Part I.A.1.b of the 1992 Permit, which provides that "[t]he discharges [from the Station] shall not jeopardize any Class B use of the Merrimack River and shall not violate applicable water quality standards." Finally, Count 5 focuses on ongoing violations of the annual reporting requirements in Part 1.A.13 of the 1992 Permit: "All biological and hydrological monitoring program data shall be submitted to the [New Hampshire Department of Environmental Services], [New Hampshire Fish and Game Department], [United States Fish & Wildlife Service], and the [EPA] Regional Administrator by December 31 of the following year."

[16] Id. at AF ¶ 10.

A. Statutory framework

"Congress' purpose as reflected in the language of the CWA is to 'restore and maintain the . . . integrity of the Nation's waters.'" Cnty. of Maui, Hawaii v. Hawaii Wildlife Fund, 140 S. Ct. 1462, 1468 (2020) (quoting 33 U.S.C. § 1251(a)). To that end, the CWA provides that "the discharge of any pollutant by any person shall be unlawful," unless it complies with one of the statute's exceptions. Id. §§ 1311(a), 1342. As one exception, the CWA enables the EPA or an authorized state agency to issue a NPDES permit for the discharge of pollutants, including heat, into the Nation's waters. Id. § 1342(a); see also id. at § 1362(6) (identifying heat as a pollutant).

The permitting authority, in this case the EPA, is tasked to design a NPDES permit that "assure[s] compliance with . . . applicable requirements," consisting of technology and water quality-based standards. See id. §§ 1342(a)(1), 1341(a)(1)-(2), 1311(b)(1)-(b)(2). The EPA can adopt pollutant discharge limitations that deviate from those required under technology and water quality-based standards if the "owner or operator of the [source of the discharge] . . . can demonstrate to the satisfaction of the Administrator . . . that any effluent limitation proposed for the control of the thermal component of any discharge . . . [is] more stringent than necessary to assure the projection 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 . . . ." Id. § 1326(a). This deviation is referred to as a § 316(a) variance.

When issuing a NPDES permit, the EPA begins with a draft permit, which it issues alongside a fact sheet "set[ting] forth the principal facts and the significant factual, legal,

methodological and policy questions considered in preparing the draft permit." 40 C.F.R. § 124.8(a). Following that "the EPA publishes a public notice of the draft permit," and "[t]he public comment period opens." City of Taunton, Massachusetts v. United States Env't Prot. Agency, 895 F.3d 120, 124 (1st Cir. 2018).

The EPA then reviews the comments and issues a final decision "to issue, deny, modify, revoke and reissue, or terminate a permit." 40 C.F.R. § 124.15(a). Along with the final permit decision, the EPA provides a "response to comments" that "specif[ies] which provisions . . . of the draft permit [were] changed in the final permit decision . . . [and] [b]riefly describe[s] and respond[s] to all significant comments on the draft permit . . . raised during the public comment period[.]" Id. § 124.17(a). Once the EPA issues a NPDES Permit, it remains in effect for up to five years. 33 U.S.C. § 1342(a)(3), (b)(1)(B). The permittee may apply for renewal before the Permit expires. Relevant here, "[a]ny person who filed comments on the draft permit or participated in a public hearing on the draft permit may file a petition for review" of a final permit decision with the Environmental Appeal Board, contesting or raising a "specific challenge to the permit decision . . . ." 40 C.F.R. § 124.19(a).

B. The Station's permitting history

The EPA first issued a NPDES permit for Merrimack Station in the 1970s, and it renewed the permit in 1985, 1992, and, most recently, in 2020.[17] Each of these permits

[17] Id. at AF ¶ 8.

focused, in relevant part, on controlling the Station's intake of water from the river and its release of "waste heat" or "thermal discharges" back into the river.[18]

In the EPA's words, Merrimack Station underwent "different stages of permit development, which evolved over a number of years, were driven by factual and legal developments that altered development of the permit[,] and took time to address."[19] The development of the 1992 Permit, the 2011 Draft Permit, and the 2020 Permit is most pertinent to the issues in this case.

According to the EPA, the "1992 Permit set thermal discharge requirements based on a combination of a CWA § 316(a) variance and water quality-based requirements."[20] In 1997, the then-owner of Merrimack Station, PSNH, applied for renewal of the 1992 Permit "with thermal discharge conditions matching those in the existing [1992] [P]ermit"—that is, "conditions . . . compatible with continued year-round open-cycle cooling at Merrimack Station."[21] The EPA administratively continued the 1992 Permit after PSNH's timely request for renewal, and the 1992 Permit remained "fully effective and enforceable."[22] See 40 C.F.R. § 122.6.

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[18] 2011 Determinations Document (Pls.' Ex. 3) at 2; 2020 Response to Comments (Defs.' Ex. 9) at 12 ("These three areas of regulation (i.e., setting permit requirements for cooling water withdrawals, discharges of waste heat, and discharges of other types of steam electric power plant pollutant discharges) comprise the primary areas that EPA, the State of New Hampshire, the Permittee, and the public focused on throughout permit development.").

[19] 2020 Response to Comments (Defs.' Ex. 9) at 11.

[20] Id. at 12.

[21] Doc. no. 93 at AF ¶ 37.

[22] 2011 Determinations Document (Pls.' Ex. 3) at 2, 34.

In September 2011, the EPA issued a draft NPDES permit for public comment, along with a fact sheet. Components of the fact sheet were entered into evidence at trial, including a "Draft Permit Determinations Document," which "present[ed] and explain[ed] certain determinations made by EPA in support of the [2011] draft NPDES permit."[23] The court refers to this document as the 2011 Determinations Document throughout this Order.

The 2011 Draft Permit did not renew the same thermal limits and CWA § 316(a) variance as in the 1992 Permit. In the 2011 Determinations Document, the EPA explained that PSNH no longer satisfied the requirements for a § 316(a) variance, in part because the evidence demonstrated that Station's thermal discharge had "caused, or contributed to, appreciable harm to Hooksett Pool's balanced, indigenous community of fish."[24] The EPA "instead[ ] decided that [the permit] should base thermal discharge limits on technology-based and water quality-based requirements."[25] In particular, the EPA concluded that one "available alternative" to the 1992 Permit conditions was to "convert[ ] Merrimack Station's open-cycle cooling system to a closed-cycle cooling system using . . . mechanical draft cooling towers."[26] The cooling towers would "chill the cooling water so that it can be re-used for condensing steam" and could potentially

[23] Id. at 2.

[24] Id. at 154; see also infra Section III.E.1.

[25] 2020 Response to Comments (Defs.' Ex. 9) at 12.

[26] 2011 Determinations Document (Pls.' Ex. 3) at 10.

"reduce the thermal discharges and water withdrawals by approximately 95 percent as compared to an open-cycle system."[27]

In explaining its determinations, the EPA discussed the Station's operations. It noted that Units 1 and 2 function as "'baseload' generating units," meaning that "[o]nce connected to an electrical grid, [each] unit's operating parameters [is] maintained to keep its electrical output as close as possible to its nameplate rating[,]" and "[t]he utility's objective is to operate the generating unit continuously at a constant electrical output . . . ."[28] In other words, baseload facilities "generally . . . operate or near full load and on a near-constant basis."[29]

Some time after the issuance of the 2011 Draft Permit, the EPA observed that the Station had converted from a baseload facility to a peaking facility, which operates "intermittent[ly] . . . in the winter and summer months"[30] in order "to meet periods of higher demand for electricity."[31] In August 2017, the EPA issued a "Statement of Substantial New Questions for Public Comment," reopening the public comment period to address, among other questions, whether the thermal discharge limits should change

[27] Id. at 3, 49 (emphasis in original).

[28] Doc. no. 93 at AF ¶ 39 (quoting 2011 Determinations Document (Pls.' Ex. 3) at 165).

[29] Id. at AF ¶ 88.

[30] Id. at AF ¶ 58 (quoting 2020 Response to Comments (Defs.' Ex. 9) at 53).

[31] Id. at AF ¶ 88.

based on the Station's impending sale to the defendants and its "reduced" operations as a peaking facility.[32]

Finally, in May 2020, the EPA issued a new NPDES Permit for Merrimack Station, which was intended to take effect in September 2020 and "supersede[]" the 1992 Permit.[33] As required, the EPA also issued Responses to Comments with the Permit. Throughout this Order, the court refers to this document, which forms part of the trial record, as the 2020 Response to Comments.

Roughly one month prior to the 2020 Permit's effective date, the defendants and the plaintiffs timely filed petitions for review before the Environmental Appeals Board, with each party contesting different conditions in the 2020 Permit.[34] A request for review of an NPDES permit has the initial effect of staying the new permit entirely.[35] Following the submission of a request for review, the Regional Administrator determines and notifies the parties which of the new permit's provisions are (i) uncontested, (ii) contested, or (iii) uncontested but inseverable from contested conditions.[36] Under EPA regulations, the uncontested conditions "become fully effective enforceable obligations of the permit" 30 days after the Regional Administrator's notification.[37] The other two

[32] Id. at AF ¶ 44; id. at AF ¶ 58 (quoting 2020 Response to Comments (Defs.' Ex. 9) at 53).

[33] See 2020 Permit (Defs.' Ex. 8) at 1.

[34] Doc. no. 93 at AF ¶ 45.

[35] Id. at AF ¶ 46.

[36] Id.

[37] Id. at AF ¶ 47.

categories of conditions remain "stayed . . . pending final agency action," and the permittee must continue to comply with the corresponding conditions of the old permit.[38]

In this case, the Regional Administrator notified the parties of its determination regarding contested conditions on September 1, 2020.[39] Several of the 1992 Permit conditions, including all of the conditions that feature in the plaintiffs' complaint, correspond with the contested conditions and accordingly remain in place for the duration of the appeals process, until there is a final agency action.[40] The Regional Administrator determined that the other conditions within the 2020 Permit were uncontested and severable, rendering those conditions effective as of October 1, 2020.[41] The EAB remanded the contested conditions to EPA Region 1 on August 3, 2021.[42]

C. Relevant features of the 1992 and 2020 Permits

Certain features of the 1992 and 2020 Permits, as well as differences between the two permits, factor into the parties' evidence and theories of the case. First, and particularly important, Part I.A.11.a of the 1992 Permit—which remains in effect—requires the defendants to monitor the water temperature in three locations of the river,

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[38] Id.

[39] Id. at AF ¶ 48.

[40] Id.; see also Pls.' Ex. 71. at 3 ("As required by 40 C.F.R. § 124.16(c)(2), to the extent that conditions of the Permit are stayed, the Permittee must comply with the conditions of its existing permit (i.e., the 1992 Permit) that correspond to the stayed conditions listed above. The 1992 Permit conditions that remain in effect are: Part I.A.1.b, Part I.A.1.c, Part I.A.1.f, Part I.A.1.g, Part I.A.4.f, Part I.A.11.a-b and Part I.A.13.").

[41] Id. at AF ¶ 49.

[42] Id. at AF ¶ 50; see also Pls.' Ex. 72.

referred to as "N10," "S0," and "S4."[43] The N10 location is upstream from the Station and captures ambient river temperatures; the S0 location is at the end of the Station's cooling canal; and the S4 location is .4 miles, or about 2,000 feet, downstream from the end of the cooling canal and about two miles upriver from the lower end of the Hooksett Pool.[44] GSP has placed a single temperature probe at each of these locations, which "record open-river surface water temperatures" at those spots.[45] The probes at N10 and S4 are removed each fall and replaced each spring, consistent with the 1992 Permit requirement.[46]

Next, Ihe 1992 Permit contains narrative thermal limits, as previously noted. By contrast, the 2020 Permit sets forth numeric thermal limits, which change over the course of the year. According to the EPA, these limits are based on the life stage and thermal tolerance of fish that are present in the Hooksett Pool at that time.[47] Specifically, the 2020 Permit includes year-round temperature limits, including weekly average (chronic) and daily maximum (acute) temperature limits applicable to the S4 location at specific times of the year.[48] These limits are all stayed due to the appeals process.[49]

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[43] Doc. no. 93 at AF ¶ 22.

[44] Id. at AF ¶ 24.

[45] Id. at AF ¶ 23.

[46] Id. at AF ¶ 25.

[47] See infra Section III.E.1.

[48] Id. at AF ¶ 52.

[49] Id.

The permittee is not in violation of the 2020 Permit if the thermal limits are exceeded when the Station is not operating.[50] The 2020 Permit also sets forth three conditions (which the court refers to as "Alternative Compliance Conditions") under which the Station will remain in compliance, even if the Station is operating and the temperature readings at S4 exceed the Permit's numeric limits. The Alternative Compliance Conditions are presently stayed, as well.[51]

The first two Alternative Compliance Conditions relate only to the weekly average temperature limits. Under what the court refers to as the Capacity Factor Alternative Compliance Condition, the Station is considered to be in compliance if its 45-day average capacity factor is less than 40%.[52] Capacity factor is a "measure of a power plant's level of output," and it is "defined as the ratio of the actual production of the plant divided by the potential production of the plant."[53] The permittee is not required to report the weekly average temperature at Station S4 for the periods in which the capacity limitation is satisfied.[54] This Alternative Compliance Condition applies from May through September.[55]

Under the next Alternative Compliance Condition, if the ambient temperature is above the weekly average temperature limit, the Station remains in compliance as long as

[50] Id. at AF ¶ 56.

[51] Id. at AF ¶¶ 53-55.

[52] Id. at AF ¶ 53.

[53] Id. at AF ¶ 89.

[54] Id. at AF ¶ 53.

[55] Id.

the weekly average temperature at S4 does not exceed the temperature at N10 by more than 2˚ C.[56] A difference in temperature is referred to in shorthand as a "Delta-T"; accordingly, the court refers to this condition as the Delta-T Alternative Compliance Condition.

The third Alternative Compliance Condition pertains only to the daily maximum temperature limit. If the hourly average temperature reading at S4 is found to be greater than the daily maximum limit, the defendants are required to reduce operations or take other measures to ensure that the temperatures at S4 comply with the numeric limits within three hours.[57]

In adopting the numeric thermal limits in the 2020 Permit, the EPA explained that the 1992 Permit's narrative limits (which are the subject of the instant suit) were no longer needed. Specifically, the EPA determined:

> The additional backstopping provisions made some sense for the 1992 permit because a CWA § 316(a) variance was being granted in the absence of detailed thermal data and analysis, as the commenter has noted farther above.
> . . .
>
> Now, for the Final Permit, EPA has set stringent, specific thermal discharge limits based on a CWA § 316(a) variance that recognizes and is premised on the Facility's much reduced operations over the last several years. EPA has also determined after an extensive, detailed analysis that these thermal discharge limits will assure the protection and propagation of the Hooksett Pool's [balanced indigenous population]. As a result, EPA concludes that the additional narrative, water quality-based provisions are no longer needed. The Final Permit also requires significant thermal and biological monitoring. If it turns out that the Final

[56] Id. at AF ¶ 54.

[57] Id. at AF ¶ 55.

Permit's thermal discharge limits are not adequately protective, they can be appropriately tightened in the future.[58]

II. Applicable Legal Standard[59]

As previously noted, the plaintiffs bring this suit under the CWA's citizen suit provision. This portion of the statute provides that "a suit to enforce any limitation in an NPDES permit may be brought by any 'citizen,' defined as 'a person or persons having an interest which is or may be adversely affected.'" Friends of the Earth, Inc. v. Laidlaw Env't Servs. (TOC), Inc., 528 U.S. 167, 174 (2000) (quoting 33 U.S.C. § 1365(a), (g)). Citizen suits may not be premised on "wholly past violations," however. Gwaltney of Smithfield, Ltd. v. Chesapeake Bay Found., Inc., 484 U.S. 49, 64 (1987). Rather, plaintiffs can bring suit under this provision to redress "either continuous or intermittent violation—that is, a reasonable likelihood that a past polluter will continue to pollute in the future." Id. at 57.

Moreover, as stated supra Section I, it is undisputed that the defendants assumed ownership of the Station on January 10, 2018. Thus, the defendants were not subject to the Permit requirements, nor liable for Permit violations, prior to January 10, 2018.

In order to prevail at this stage, the plaintiffs must prove their claims by a preponderance of the evidence. See Carr v. Alta Verde Indus., Inc., 931 F.2d 1055, 1064 (5th Cir. 1991) (once a citizen suit under the CWA proceeds to trial, the court must

[58] 2020 Response to Comments (Defs.' Ex. 9) at 332; see also infra Sections III.D, III.E, III.G.

[59] The statements in this Section are rulings of law.

"actually decid[e] the issue[s] based on a preponderance of the evidence."). "The burden of showing something by a preponderance of the evidence, the most common standard in the civil law, simply requires the trier of fact to believe that the existence of a fact is more probable than its nonexistence before he may find in favor of the party who has the burden to persuade the [judge] of the fact's existence." Concrete Pipe & Prod. of California, Inc. v. Constr. Laborers Pension Tr. for S. California, 508 U.S. 602, 622 (1993) (internal quotations omitted).

III. Analysis[60]

Below, the court analyzes and makes rulings on the key legal issues in this case—standing, the deference owed to the EPA's relevant determinations as the agency that issued the NPDES permit, and the merits of each of the plaintiffs' claims.

A. Standing

The defendants assert lack of standing as an affirmative defense. To have standing to sue, a plaintiff must have "such a personal stake in the outcome of the controversy as to assure that concrete adverseness which sharpens the presentation of issues upon which the court so largely depends for illumination of difficult . . . questions." Dubois v. U.S. Dep't. of Agric., 102 F.3d 1273, 1280 (1st Cir. 1986) (quoting Baker v. Carr, 369 U.S. 186, 204 (1962)). In order to satisfy this requirement, "a plaintiff must show (1) it has suffered an 'injury in fact' that is (a) concrete and particularized and (b) actual or imminent, not conjectural or hypothetical; (2) the injury is fairly traceable to the

[60] This Section contains both findings of fact and rulings of law, as indicated in the text.

challenged action of the defendant; and (3) it is likely, as opposed to merely speculative, that the injury will be redressed by a favorable decision." Laidlaw, 528 U.S. at 180-81. Of relevance here, associations or organizations, like the plaintiffs, "ha[ve] standing to bring suit on behalf of [their] members when [their] members would otherwise have standing to sue in their own right, the interests at stake are germane to the organization's purpose, and neither the claim asserted nor the relief requested requires the participation of individual members in the lawsuit." Id. at 181.

The parties agree that certain elements of organizational standing are satisfied here. It is undisputed that the plaintiffs "are asserting . . . their interest in protecting the Merrimack River and its aquatic species from thermal discharges from [the] Station[,] [and] [t]hose interests are germane to [the] [p]laintiffs' purposes to protect the health of New England's and New Hampshire's water resources."[61] The defendants' challenge centers instead on the injury-in-fact element of standing. According to the defendants, none of the plaintiffs' members has demonstrated a sufficient injury stemming from the Station's challenged conduct—its thermal discharges.[62] The court disagrees.

The United States Supreme Court has held that "environmental plaintiffs adequately allege injury in fact when they aver that they use the affected area and are persons 'for whom the aesthetic and recreational values of the area will be lessened' by the challenged activity." Id. at 183. Further, "[t]he injury need not be significant; a small

[61] Doc. no. 93 at AF ¶ 108.

[62] Defs.' Post-Trial Conclusions of Law (doc. no. 154) at ¶ 16.

stake in the outcome will suffice, if it is direct." Dubois, 102 F.3d at 1281 (internal quotation omitted).

In an effort to establish the requisite injury, the plaintiffs entered into evidence affidavits from three standing witnesses, and they presented testimony from two of those witnesses at trial. The parties agree that the standing witnesses were members of one or both of the plaintiff organizations when the complaint was filed, and that they remain members of the organization(s).[63] Specifically, two of the witnesses, Lucinda Reid and Benjamin MacBride, are members of Sierra Club and Conservation Law Foundation, while the third witness, Mark Feigl, is a member of Conservation Law Foundation.[64] The court focuses its analysis on the two witnesses who testified—MacBride and Feigl—since it was able to judge their credibility in person.

MacBride credibly testified as follows. MacBride has lived in Concord, New Hampshire since 2013.[65] Throughout his time in Concord, he has enjoyed hiking and walking on trails along the Merrimack River with his family, including his children.[66] Over the past seven years, he has also swum in the river with his family on occasion.[67] MacBride learned from Sierra Club that the Station is dispensing heated water into the river, and it "concerns" him that the discharges have "been altering the natural state of the

[63] Id. at AF ¶ 108.

[64] Id. at AF ¶¶ 109-10.

[65] Id. (MacBride) at 32:23.

[66] Id. (MacBride) at 35:17-36:4, 36:17-24.

[67] Id. (MacBride) at 37:3-9.

river at that location."[68] He recreates in the areas upstream of the Station, and not in or along the Hooksett Pool, because of "[g]eneral concern . . . about the presence of [the Station] . . . and the possible effects that it has on both the river as well as the native species and inhabitants of the river and the surrounding area."[69] According to MacBride, "if the station were required to reduce the impact that [it is] having on the natural environment," his "enjoyment . . . of the river would be improved and enhanced."[70]

Feigl persuasively testified to his involvement in recreational activities in and around the river and pool, and the impact of the Station's discharges on the same, as follows. Feigl has lived in Concord, New Hampshire for 26 years and has an "interest in rivers."[71] He visits the Merrimack River multiple times each week to walk, duck hunt, canoe, kayak, and photograph the area.[72] He engages in similar activities at the Hooksett Pool portion of the river, both upstream and downstream of the Station, roughly 20 to 30 times a year.[73] He also "enjoy[s] seeing . . . fishermen [and] sportsmen" fishing in the river and would be "crush[ed]" . . . if . . . the fish were affected" or "if there were no fish" there.[74]

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[68] See id. (MacBride) at 42:22-43:14.

[69] Id. (MacBride) at 42:14-21.

[70] Id. (MacBride) at 46:12-15.

[71] Trial Tr. 10.21.22 AM (Feigl) 5:5-8, 6:1-2.

[72] Id. (Feigl) 6:8-12.

[73] See id. (Feigl) at 8:5-9:4, 9:25-10:10, 25:15-20.

[74] Id. (Feigl) at 22:1-6.

For Feigl, it is "important . . . that the river is clean and healthy[,]" given that he has an interest in the river and surrounding activities, his daughter and he swim in the river, his dog drinks from and plays in the river, and he consumes ducks that eat the fish in the river.[75] Feigl "ha[s] concerns about what the discharge from the [Station] may be doing to the health and quality of the river[,]" and he "think[s]" that he "would feel better about walking and canoeing and hunting along the river if [he] knew that the . . . [S]tation were in full compliance" with the NPDES Permit.[76]

With this testimony, the plaintiffs have established that MacBride and Feigl personally recreate in and around the river and/or pool and would enjoy these activities more if they knew that the Station was not harming the health and natural state of the water body. The witnesses' concerns regarding the Station's discharges are reasonable, given their knowledge of the Station's discharges, personal interests, and recreational activities, and these concerns credibly limit their enjoyment and use of the river and pool. This is sufficient to establish an injury in fact that is fairly traceable to the Station's discharges and redressable, at least in part, through the requested remedies, which seek to limit the Station's discharges and ensure compliance with the NPDES Permit. See, e.g., Laidlaw, 528 U.S. at 184 (finding "nothing improbable about the proposition that a company's continuous and pervasive illegal discharges of pollutants into a river would cause nearby residents to curtail their recreational use of that waterway and would subject

[75] See id. (Feigl) at 10:21-11:19.

[76] Id. (Feigl) at 14:18-20, 15:20-22.

them to other economic and aesthetic harms" that constitute an injury in fact); Dubois, 102 F.3d at 1283 (finding, at the motion to dismiss stage, that a plaintiff had standing to challenge the expansion of a skiing facility based on the allegations that his "family home is located squarely within the geographical area allegedly directly affected by the proposed project, [he] visits the area regularly, [he] drinks the water which will allegedly be tainted by pollutants, and [he] will allegedly be deprived of his environmental, aesthetic and scientific interests in ways directly tied to the project he challenges").

B. Deference to EPA findings and determinations

Resolution of the plaintiffs' claims turns on the meaning of, and the defendants' record of compliance with, various provisions in the 1992 Permit. As previously noted, the EPA is authorized under the CWA to develop NPDES permit provisions with the goal of ensuring compliance with technology and water quality-based standards. In carrying out this role, the EPA has assessed and opined on some of the same issues presently before the court, as well as related matters, including the nature and extent of the Station's thermal discharge and its effect on the population and the conditions in the Hooksett Pool.

The EPA's analysis and conclusions on these matters form part of the trial record. In particular, the parties entered into evidence and repeatedly referenced the EPA's 2011 Determinations Document and 2020 Response to Comments, both of which the EPA issues as part of its regulatory role under the CWA. See supra Section II.A. In order to weigh this evidence, the court must determine the degree of deference owed to the EPA's findings and determinations. The parties agree that the agency's conclusions are not

entitled to judicial deference under Chevron v. U.S.A. Inc. v. Natural Resources Defense Council, Inc., 467 U.S. 837 (1984), and should instead be assessed under the standard set forth in Skidmore v. Swift & Co., 323 U.S. 134 (1944).

These two theories of agency deference differ in application and effect. Chevron deference generally applies "when it appears that Congress delegated authority to the agency . . . to make rules carrying the force of law, and that the agency interpretation claiming deference was promulgated in the exercise of that authority." United States v. Mead Corp., 533 U.S. 218, 226-27 (2001). Where applicable, Chevron requires courts to "give effect to an agency's regulation containing a reasonable interpretation of an ambiguous statute." Christensen v. Harris Cnty., 529 U.S. 576, 586-87 (2000).

In Skidmore, the Supreme Court held "that an agency's interpretation may merit some deference whatever its form, given the 'specialized experience and broader investigations and information' available to the agency . . . , and given the value of uniformity in its administrative and judicial understandings of what a national law requires." Mead, 533 U.S. at 234 (quoting Skidmore, 323 U.S. at 139-40); see also Lovgren v. Locke, 701 F.3d 5, 30 (1st Cir. 2012) ("where an agency's interpretation is announced in a manner that lacks the force of law, Chevron deference may be inappropriate[,] . . . [but] [s]uch interpretations are generally subject to review under Skidmore . . . ." (internal citations omitted)). Relevant here, the argument for applying the Skidmore standard is likely strengthened where the regulatory scheme at issue is detailed. See Mead, 533 U.S. at 235 ("There is room at least to raise a Skidmore claim

here, where the regulatory scheme is highly detailed, and [the relevant agency] can bring the benefit of specialized experience to bear on the subtle questions in this case").

In determining the amount of deference owed to agency findings under the Skidmore standard, courts consider a number of factors, including "the thoroughness evident in [the agency's] consideration, the validity of its reasoning, its consistency with earlier and later pronouncements, and all those factors which give it power to persuade, if lacking power to control." Skidmore, 323 U.S. at 140. The First Circuit Court of Appeals has held that the most "salient of the factors that inform an assessment of persuasiveness" under Skidmore is "the validity of the agency's reasoning." Doe v. Leavitt, 552 F.3d 75, 82 (1st Cir. 2009). "This inquiry does not focus on the [agency's] interpretation per se but, rather, on whether the agency has consulted appropriate sources, employed sensible heuristic tools, and adequately substantiated its ultimate conclusion." Id.

Several of the Skidmore factors weigh in favor of deference to the EPA's relevant findings, discussed more fully below, across the board.

First, some degree of deference is proper in recognition of the EPA's expertise in promulgating NPDES permits and administering the CWA. Indeed, "issuing a permit and determining its terms lie at the heart of EPA's assigned task" under the CWA. Conservation L. Found., Inc. v. Exxon Mobil Corp., 3 F.4th 61, 72 (1st Cir. 2021) (citing 33 U.S.C. § 1342); see also Arkansas v. Oklahoma, 503 U.S. 91, 105 (1992) ("Congress has vested in the [EPA] Administrator broad discretion to establish conditions for NPDES permits."). It follows that the EPA's reasonable interpretations of its own permits should

also be afforded deference. See Mead, 533 U.S. at 227-28 ("considerable weight should be accorded to an executive department's construction of a statutory scheme it is entrusted to administer."). Further, as described supra Section I.B, the EPA has been issuing NPDES Permits for Merrimack Station since the 1970s. As part of this process, the EPA has analyzed the Station's operations and the Hooksett Pool environment for decades, and engaged in data review and multiple notice-and-comment periods. This decades-long engagement with the Station adds to the EPA's expertise and reflects a level of thoroughness that further warrants deference.

Finally, the EPA's findings merit deference because of their detailed and technical nature. For example, the EPAs determinations require analysis of data concerning water temperature, river flow, and the characteristics of the pool's fish population; studies regarding different fish species' tolerance and response to heat at various life stages; and the physical dynamics of how heat pollutants disperse and travel in water.

All of these factors counsel the court against substituting its own judgment for the reasoned determinations of the EPA regarding the meaning of the relevant Permit provisions and the Station's compliance with them. But the court's Skidmore analysis does not conclude here. The court also analyzes the EPA's reasoning below, infra Sections III.D-III.G, when reviewing the EPA's individual findings regarding specific Permit provisions. As discussed further below, the court finds that the EPA's reasoning is largely thorough, consistent, and well-supported, which further (and conclusively) convinces this court that the EPA's findings warrant significant deference. The court now proceeds to the heart of the analysis—the merits of each of the plaintiffs' claims.

C. Minimal contact with the shorelines (Count 3)

In Count 3, the plaintiffs allege continuing violations of Part I.A.1.g(c) of the 1992 Permit, which prohibits the Station's "[c]ombined thermal plumes" from having more than "minimal contact with the surrounding shorelines." The court begins its analysis of this Count with a few foundational findings of fact regarding this Permit provision and the nature of the plaintiffs' evidence of its violation.

First, the parties agree that the Permit does not define or otherwise provide quantitative parameters for the minimal contact requirement. It is also undisputed that the plaintiffs have not monitored the temperature at any point along the shorelines of the Hooksett Pool.[77] Instead, the plaintiffs' evidence in support of this claim consists of a model developed by engineer Matthew Hodge, to identify when the Station's discharges created an "extensive thermal plume"—that is, a plume with size and temperature characteristics that he considers to be the "opposite" of "minimal contact with the surrounding shorelines."[78] The court summarizes Hodge's opinion below, and then proceeds to assess a foundational flaw within it, which renders his opinion insufficient to prove an ongoing violation of the minimal contact requirement by a preponderance of the evidence.

[77] Doc. no. 93 at AF ¶ 90.

[78] Expert Report of Matthew Hodge ("Hodge Expert Report") (Pls' Ex. 16) at 5.

1. Hodge's opinion

Hodge defined an extensive thermal plume by its temperature as well as its three-dimensional shape. His extensive thermal plume has "a lateral extent (i.e., width across the river), a vertical extent (i.e., depth into the water column), and a longitudinal extent (i.e., distance downstream)."[79] First, the plume must be at least 1° C (1.8° F) warmer than the ambient river water, which is measured at Station N10, a monitoring station approximately one mile upstream from the plant's point of discharge.[80] As noted above, a difference in temperature is referred to throughout this Order in shorthand as a Delta-T. Second, the extensive thermal plume must "contact[ ] the shoreline from bank to bank" at least for the distance between Station S4 (again, located .4 miles downstream of the discharge point) and a monitoring station 1.6 miles downstream from the discharge point, referred to as S16.[81] Third, the plume "extends below the surface to the bottom of the river" at monitoring station A00, which is more than 2.5 miles downstream from the discharge point; according to Hodge, this point is at the Hooksett Dam.[82]

In order to determine the presence of an extensive thermal plume in 2018 and afterwards, the relevant period for this litigation, Hodge needed to identify the water temperature at points that represent the boundaries of his extensive thermal plume—S4, S16, and A00. Hodge used river flow data and temperature data from 2009 to develop a

[79] Expert Rebuttal Report of Matthew Hodge (Pls.' Ex. 17) at 20.

[80] Hodge Expert Report (Pls' Ex. 16) at 4.

[81] Id.

[82] Id.

linear regression model that can predict the downstream river temperatures during "periods when there is no temperature monitoring" at those locations.[83] The "comprehensive" 2009 temperature dataset Hodge used for this model was collected at six cross-sections of the river, including A00 and points near the monitoring stations identified in the 1992 Permit—N10, S0, and S4. Nine probes were installed at each cross-section except for A00; these probes were placed on the east, center, and west portions, as well as the top, middle and bottom depths, of each cross-section.[84]

Hodge used his regression model to predict downstream river temperatures during seven of the thirteen periods when Merrimack Station was operating from May through October of 2018 and 2019.[85] Hodge determined that these seven periods lent themselves to such evaluation based on the nature of the Station's operation and the reliability of the surrounding data; in particular, he only considered periods in which the Station operated for more than 37 hours, as "[s]table temperatures are present downstream of the discharge during these periods of extended operation."[86] Of these seven periods, Hodge identified four periods during which the Station's discharge created an extensive thermal plume: August 27-30, 2018; July 18-22, 2019; August 27-30, 2019; and September 2-4, 2019.[87]

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[83] Id. at 9, 26, 31, 42.

[84] Id. at 19.

[85] See id. at 31; see also id. at 38 (identifying the predictor variables in the linear regression model and listing the input and output values for 2018-19 linear regression).

[86] Id. at 15-16, 31.

[87] See id. at 38-39.

One conclusion that Hodge drew from his regression results was "that the thermal plume is more likely to go bank to bank and violate the minimal contact requirement when Unit 2 is in operation and flow is less than 2,000 [cubic feet per second]."[88] He reasoned in part that, of the seven periods he considered, an extensive thermal plume arose in "[a]ll three of the periods when flow was below 2,000 cfs and Unit 2 was in operation."[89] He further explained that only Unit 1 was operating when the fourth extensive thermal plume arose, but this was also the period with "the second lowest flow."[90]

Building off of this conclusion, Hodge calculated the likelihood of an extensive thermal plume occurring in the future, based on the probability of two independent events taking place at the same time—low-flow conditions *(*which he defined as less than 2,000 cfs) and the operation of Unit 2. He assessed decades of flow data to determine that the likelihood of low-flow conditions occurring from June through October (the "driest time of the year") is 51%.[91] Hodge calculated that, if Unit 2 operates four or more times during that same period, there is a greater than 90% chance that an extensive thermal plume will develop, and the minimal contact condition will be violated, that year.[92] Extrapolating from the fact that Unit 2 operated at least four times during those months in

[88] Id. at 39.

[89] Id.

[90] Id.

[91] Id. at 11-12, 44.

[92] Id. at 44.

2016, 2018, and 2019, Hodge projected that "it is very likely that Merrimack Station will cause extensive thermal plumes and violate the minimal contact condition . . . in 2020 and future years."[93]

2. A core flaw in Hodge's model

The defendants set forth evidence critiquing several aspects of Hodge's concept of an extensive thermal plume and his regression model. The challenges to Hodge's temperature criteria for the extensive thermal plume—the 1˚ C Delta-T threshold—are particularly persuasive and dispositive, as explained further below.

To begin, in his report, Hodge provides some reasoning for his selection of a 1˚ C Delta-T threshold. Hodge asserted that his "Delta-T threshold value is within the range of values used by Merrimack Station consultants in the past and within the range of values used by other states in US EPA Region 1."[94] He further explained:

> My threshold value is higher than the value used by [Merrimack Station's environmental consultant] Normandeau [Associates, Inc.] . . . when they identified "the potential area available to migrating salmon smolts" as the area that experiences a Delta-T of less than 0.5˚ C (0.9˚ F). . . . On the other hand, my threshold value is lower than the value used by [another Merrimack Station environmental consultant] when they defined a "significant" thermal plume as an increase above background of 2˚ C (3.6˚ F) or more. It is logical to conclude that the threshold value for the thermal plume should be less than the threshold value for a significant thermal plume. Similarly, of the six states within US EPA Region 1, three (Vermont, Connecticut, and Rhode Island) have water quality standards that include quantitative limits to the increase in water temperature relative to ambient temperatures. Vermont limits the increase in temperature for warm water fish habitat from 0.6˚ C (1˚ F) to 2.8˚ C (5˚ F) depending on the ambient temperature . . . Connecticut limits the increase in temperature to 2.2˚ C (4˚ F) and may be further limited to 0.8˚ C (1.5˚ F) depending on the classification of the

[93] Id.

[94] Id. at 18.

> water body . . . . Rhode Island limits the increase in temperature for fresh waters to less than 2.2˚ C (4˚ F) . . . .[95]

This discussion raises more questions than it answers regarding Hodge's Delta-T selection. Hodge did not explain why it is reasonable to place his Delta-T threshold value at a point between the other threshold values he cites, nor why he selected the precise threshold of 1˚ C, from the range of values he described. Further, unlike the states of Vermont and Connecticut, which adjusted their Delta-T values based on the "classification of the water body" or the "ambient temperature," Hodge did not assert that he grounded his Delta-T value in biological criteria, thermal conditions, or other surrounding circumstances. Hodge's testimony at trial did not resolve this gap in his reasoning. He testified that he selected the Delta-T threshold value "based on [his] professional experience working on NPDES permitting of thermal discharges."[96]

The importance of Hodge's precise Delta-T selection became apparent during his cross-examination, when he testified that he would have only found one extensive thermal plume if he had selected a Delta-T greater than 1.2˚ C.[97] Importantly, this higher threshold value would pass muster under the general criteria that Hodge set forth in the above excerpt from his report. Indeed, a Delta-T of 1.25˚ C (for example) would also "fall within the range of values used by Merrimack Station consultants in the past and

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[95] Id.

[96] Trial Tr. 10.18.22 AM (Hodge) at 14:12-17. The court cites to the transcripts from trial with the date; an "AM" or "PM" designation for morning and afternoon sessions, respectively; the witness's last name; and the page and line numbers.

[97] Id. (Hodge) at 100:1-12.

within the range of values used by other states in US EPA Region 1."[98] This means that one of Hodge's key findings—that four extensive thermal plumes arose in 2018 and 2019—is highly sensitive to small changes in his Delta-T threshold value, a number that he selected for reasons that are not clear from the record.

The relative absence of support and reasoning for Hodge's Delta-T selection also taints the remainder of Hodge's opinion, as it all flows from his definition of the foundational concept of an extensive thermal plume. Indeed, each of Hodge's ultimate conclusions—regarding the occurrence of extensive thermal plumes in 2018 and 2019; the relationship among low-flow conditions, the operation of Unit 2, and extensive thermal plumes; and the probability of extensive thermal plumes occurring in the future—all lack weight and meaning since his definition of the extensive thermal plume is not sufficiently substantiated and credible. Given that their evidence supporting this claim consists entirely of Hodge's opinion, the plaintiffs have not sustained their burden to prove a violation of the minimal contact requirement by a preponderance of the evidence. The court accordingly rules in the defendants' favor on Count 3.

D. Blocking the zone of fish passage (Count 1)

In Count 1, the plaintiffs allege violations of Part I.A.1.g(a) of the Permit, which provides that "[t]he combined thermal plumes for the [S]tation shall . . . not block the zone of fish passage." In a previous Order on a summary judgment motion, the court

[98] Hodge Expert Report (Pls.' Ex 16) at 18.

determined that this provision bars the Station's thermal plumes from blocking the zone—that is, region or area—through which fish passage occurs.[99]

The court has not previously determined the meaning of "block" or the scope of the "zone of fish passage," however. At trial, the parties propounded differing interpretations of these operative terms. They also presented evidence attempting to prove Permit violations or compliance, consistent with their individual interpretations of the provision.

In assessing this claim, the court begins with factual findings that provide context for the remainder of the analysis. Then, the court summarizes each party's position and evidence before concluding that the plaintiffs have not proven an ongoing Permit violation by a preponderance.

1. Foundational factual findings

To begin, this claim centers on two species of fish that migrate through the Hooksett Pool—alewife and American shad.[100] It is undisputed that these fish are anadromous, meaning that they live in both freshwater and saltwater, at different points in their life cycles.[101] The fish spawn in freshwater such as the Hooksett Pool, remain there for a period to grow and gain strength, and then migrate to the ocean during their first

[99] Dec. 30, 2021 Summary Judgment Order (doc. no. 81) at 15.

[100] Doc. no. 93 at AF ¶ 92.

[101] Id. at AF ¶ 94.

year of life.[102] They then return years later to spawn in the freshwater again.[103] A series of dams in the Merrimack River inhibit upstream migration of these fish at various locations; thus, alewife and American shad are only able to migrate downstream through the Hooksett Pool.[104] The subject Permit provision accordingly concerns blockage of these species' downstream migration through the pool.

Both parties offered expert witness opinions from biologists to support their positions. The defendants' expert, Lawrence Barnthouse, Ph.D., has "been involved in assessments of the impacts of power plants on fish populations since 1977."[105] The plaintiffs' expert, Adrian Jordaan, Ph.D., is an Associate Professor of Fish Population Ecology and Conservation at the University of Massachusetts Amherst, with "past and present research experience on temperature effects on fish, as well as movement associated with fish passage structures, and impact of lost fish passage, on fish species."[106]

Both experts, as well as the EPA, agree that heat can have detrimental effects on fish health, survival, and propagation. Indeed, Dr. Jordaan described temperature as a "master variable" that "controls organization of aquatic system from cellular systems to

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[102] Id. at AF ¶ 95.

[103] Id.

[104] See id. at AF ¶¶ 96, 98.

[105] Expert Report of Larry Barnthouse ("Barnthouse Expert Report") (Defs.' Ex. 35) at 2; Resume of Lawrence Barnthouse (Defs.' Ex. 34) at 1.

[106] Expert Report of Adrian Jordaan ("Jordaan Expert Report") (Pls.' Ex. 19) at 2.

ecosystem functioning."[107] The EPA further explained that "[w]ater temperature affects virtually all biochemical, physiological, and life history activities of fishes[,] . . . [including] metabolic rate, energy reserves, growth, reproduction, migration of fish, egg maturation, incubation success, inter- and intraspecific competitive ability and resistance to parasites, diseases, and pollutants."[108]

The experts and the EPA refer to various thermal tolerance levels, or thermal benchmarks, to describe how fish respond to different temperatures. Fish have optimal temperature ranges, in which they function most efficiently.[109] As temperatures rise above these optimal ranges, they can reach avoidance levels, at which point fish respond (as the name suggests) by avoiding the water, if they can. This behavior is an "adaptation that allows fish to escape harmful temperatures."[110] Above avoidance levels are lethal thermal limits, which can result in fish mortality. [111] In general, fish suffer worse effects

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[107] Id. at 4.

[108] 2011 Determinations Document (Pls.' Ex. 3) at 62.

[109] See Trial Tr. 12.2.22 AM (Barnthouse) at 39:24-40:2 ("Q. Now, each species of fish has evolved to have an optimum temperature at which they grow most effectively, correct? A. Correct."), Jordaan Expert Report (Pls.' Ex. 19) at 7 (fish "tend to be found within a range of temperatures that avoid both lower and upper thermal limits, a sweet spot where growth is maximized and the species are most likely to persist . . . .").

[110] Barnthouse Expert Report (Defs.' Ex. 35) at 30; accord Jordaan Expert Report (Pls.' Ex. 19) at 19, 22 (referencing fish "avoidance strategy" and noting that, where plumes reach alewife avoidance temperatures, this "would suggest [the alewife's] avoidance of plumes.").

[111] Jordaan Expert Report (Pls.' Ex. 19) ("Although fish (and other organisms) have tools to cope with a range of temperatures, each fish species has an upper thermal limit – a lethal temperature"); accord Trial Tr. 12.2.22 AM (Barnthouse) 40:23-41:9 (agreeing that above avoidance levels, fish "reach[] what is called the upper incipient lethal temperature . . . [,] the temperature at which for any given period of time half the fish in the population are expected to die," and as temperatures rise beyond that, they would all die).

as temperatures approach and then exceed their thermal tolerance levels, and as they experience longer periods of exposure to such temperatures.[112]

These thermal benchmarks vary across fish species and developmental stages.[113] Particularly relevant here, the avoidance temperature for alewife is 28.9˚ C, and the avoidance temperature for juvenile shad is a bit higher, at 29.4˚ C (according to the plaintiffs)[114] or 30˚ C (according to the defendants).[115] The court adopts this avoidance temperature for alewife because Dr. Barnthouse and the EPA rely on it,[116] and Dr. Jordaan agrees to ascribe to it, at least for his analysis in this case.[117]

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[112] See Trial Tr. 12.2.22 AM (Barnthouse) at 42:2-43:5 (agreeing, on cross-examination, that fish suffer increasing harm as temperatures rise from their optimal ranges and as they experience longer periods of exposure); 2020 Response to Comments (Defs.' Ex. 9) at 68 ("Thermal stress that extends for prolonged periods during a season, particularly the critical summer season when many fish utilize thermal conditions to optimize their ability to grow in length and weight, and to mature, can cause adverse effects to fish populations sensitive to those conditions.").

[113] Jordaan Expert Report (Pls.' Ex. 19) at 5; accord Barnthouse Expert Report (Defs.' Ex. 35) at 24 (acknowledging that thermal tolerance levels vary by fish species and life stage, citing lower thresholds for larval fish, and noting that the EPA considered these variations when developing temperature limits for the 2020 NPDES Permit); 2020 Response to Comments (Defs.' Ex. 9) at 74-85 (discussing the various thermal tolerance levels, including avoidance levels and lethal limits, for different fish species and life stages present in the Hooksett Pool).

[114] Pls.' Post-Trial Findings of Fact (doc. no. 156) at ¶ 27t (citing EPA 2020 Response to Comments (Defs.' Ex. 9) at 77).

[115] Barnthouse Expert Report (Defs.' Ex. 35) at 6.

[116] See Barnthouse Expert Report (Defs.' Ex. 35) at 30 ("The avoidance temperature used by [the] EPA" in the 2011 Draft Permit and the 2020 Permit "(28.9°C) is consistent with the summer avoidance temperature derived from Wismer and Christie (1987), and is the most defensible of the available values.").

[117] Trial Tr. 10.19.22 AM (Jordaan) at 93:24-94:5 (expressing some hesitation about adopting a single number as an avoidance level, but agreeing that "the avoidance temperature of 28.9 is used repeatedly by the literature related to this case. So I will use that temperature and just say that at [higher plume] temperatures the alewife will no longer have access to the surface.").

The court need not select between the parties' definitions of juvenile shad avoidance temperatures, given that its ruling remains the same under both alternatives. This is because, as described more fully below, the lower avoidance threshold of alewife is more central to the parties' arguments and evidence.

2. The parties' competing theories and evidence

Below, the court summarizes each party's position, beginning with the plaintiffs.

The plaintiffs' position. The plaintiffs assert, primarily through their expert witness Dr. Jordaan, that the surface waters constitute the zone of passage for American shad and alewife in the Hooksett Pool. Dr. Jordaan testified that laboratory research indicates that alewife and shad "use the upper part of the water to move," and they "move quickly in groups to avoid being preyed upon."[118] He also testified that the fish migrate at the surface of the water over the channel, or "the deepest part of the river," which is sometimes located in the center of the river, but also "meanders across the river" at certain points.[119]

According to Dr. Jordaan, fish passage is blocked when the water temperature in this specific zone reaches or exceeds avoidance levels. Dr. Jordaan testified that under these circumstances, the fish are left with "a lot of bad options"—they may (1) stop upon encountering the plume and potentially accumulate, leaving them more vulnerable to predation; (2) "swim down or around [the plume] to near the benthic zone, which is the

[118] Id. (Jordaan) at 62:5-16.

[119] Trial Tr. 10.19.22 PM (Jordaan) at 94:2-8; Trial Tr. 10.20.22 AM (Jordaan) at 87:1-17.

bottom of the river . . . [,] an area where there are lots of predators[;]" (3) "turn around and swim back upstream"; or (4) swim into the heated water "against their best judgment."[120] On top of these specific scenarios, Dr. Jordaan also opined that elevated temperatures generally increase predation threats by taxing the metabolic efficiency of fish. As a result of this biological response, Dr. Jordaan asserts, predators consume more food, and prey (such as alewife) have less energy to devote to predator avoidance.[121]

In Dr. Jordaan's opinion, each of the "bad options" he described block alewife and shad from migrating, "either because of mortality, predation by the suite of species that will eat them, or because they avoided the temperatures altogether and stopped their movements downstream."[122] In other words, under the plaintiffs' theory, fish passage is blocked when the Station's surface-oriented thermal plume reaches avoidance levels, regardless of whether fish swim through the plume or avoid it. Dr. Jordaan testified that this blocking effect occurs once the duration of the thermal plume "start[s] crossing into minutes . . . [or] tens of minutes."[123]

As evidence of past and ongoing violations, Dr. Jordaan opined that "[t]he zone of fish passage has been blocked by the bank-to-bank and top-to-bottom plumes on the dates

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[120] Trial Tr. 10.19.22 AM (Jordaan) at 94:12-95:6, 97:10.

[121] See Jordaan Expert Report (Pls.' Ex. 19) at 19 (noting that "alewives are bait fish that experience high mortality" and discussing the additional predation risks that alewife and shad face in warm water due to higher metabolic requirements).

[122] Trial Tr. 10.19.22 AM (Jordaan) at 97:14-17.

[123] Trial Tr. 10.25.22 AM (Jordaan) at 17:15-18:2

identified by Hodge . . . as having extensive thermal plumes."[124] As discussed supra Section III.C.1, Hodge identified extensive thermal plumes during four periods—August 27-30, 2018; July 18-22, 2019; August 27-30, 2019; and September 2-7 2019. According to Dr. Jordaan, these extensive thermal plumes overlapped with the period of outmigration for juvenile alewife and American shad, which he defined as mid-June through October.[125]

In an additional attempt to prove blockage, the plaintiffs also pointed to 15-minute temperature data gathered by the defendants at S4 in July and August of 2018, 2019, and 2022. The plaintiffs identified that at certain times during those months, temperatures at S4 consistently exceeded alewife avoidance levels for hours or days at a stretch.[126] The plaintiffs also uncovered two periods between July 19 and August 10, 2022 when the ambient temperatures at N10 approached or exceeded alewife avoidance levels, and the

[124] Jordaan Expert Report (Pls.' Ex. 19) at 19.

[125] Trial Tr. 10.19.22 AM (Jordaan) at 60:4-11.

[126] See, e.g., Pls.' Post-trial Findings of Fact (doc. no. 156) at ¶¶ 38k, 38m, 38n, 38v. In a post-trial submission, the plaintiffs also presented calculations of average temperatures during selected portions of 2018, 2019, and 2022, which they did not present at trial. More specifically, the plaintiffs calculated periods when average temperatures at Station S4 exceeded 28.9˚ C for a day or longer. See, e.g., id. at ¶¶ 38f, 38g, 38l. The selected periods began and ended on seemingly arbitrary times and dates. For instance, the plaintiffs calculated the average temperature at S4 from July 2, 2018 at 3:30 p.m. through July 6, 2018 at 6:30 a.m. Id. at ¶ 38f. The plaintiffs did not explain the rationale behind the start and stop times that they selected, or how sensitive their results were to those selections. The defendants appropriately assert in a post-trial brief that these calculations should not be considered because they were not entered into evidence or subject to cross-examination at trial. Doc. no. 159 at 12-13. The court agrees and accordingly does not consider the plaintiffs' averaging calculations which were not presented at trial.

temperatures at S0 and S4 were higher than that.[127] When questioned at trial about these periods, Dr. Barnthouse agreed with the plaintiffs' understanding of the temperature readings during the July 19-August 10 period.[128] He also agreed that these thermal conditions indicated that for about five days during each of those months, alewife would have experienced unsuitable temperatures if traveling through, under, or around the plume, as all of these areas would have been at or above avoidance levels when temperatures at N10 were that high.[129]

The defendants' position. The defendants ascribe to a broader and more flexible interpretation of the zone of fish passage. As a general matter, Dr. Barnthouse agreed that the surface waters over the channel are a common zone for passage. He testified that migrating alewife and shad are "not always, but often" located at the surface of the river during migration,[130] and that "their preferred route" is at the surface over the channel.[131] But the defendants do not consider the surface water to be the only zone of fish passage.

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[127] See Pls. Ex. 61 (15-minute temperature data in 2022*)*; Pls.' Ex. 85 (line graph representing the 2022 data and reflecting the temperature exceedances in July and August of 2022).

[128] Trial Tr. 12.2.22 AM (Barnthouse) at 72:3-4, 72:16-73:16, 74:20-24. When questioning Dr. Barnthouse, the plaintiffs showed him graphs depicting the temperatures during certain periods. Plaintiffs' counsel had not previously provided those graphs to defense counsel. The plaintiffs sought to admit the graphs into evidence as demonstratives of raw temperature data listed in Plaintiffs' Exhibit 61. The court permitted counsel to use the graphs when questioning Dr. Barnthouse but did not admit the graphs into evidence. Id. at 57:9-58:8. In rendering its decision, the court relied on the graphs only inasmuch as they were used to question Dr. Barnthouse.

[129] Id. (Barnthouse) at 73:18-74:19.

[130] Trial Tr. 10.25.22 AM (Barnthouse) at 94:21-25.

[131] Trial Tr. 10.25.22 PM (Barnthouse) at 23:4-8.

They contend that fish can also pass below or around the Station's surface-oriented thermal plume when it is sufficiently limited in size, temperature, and/or duration.

The defendants rely on several EPA findings to support their position. First, the record shows that the EPA has acknowledged for years that the size, temperature, duration, and configuration of the Station's thermal plumes are relevant when evaluating the plumes' effect on fish passage. Indeed, the EPA has repeatedly noted that, if the plume is sufficiently limited under these parameters, the water under or around the Station's thermal plume can provide a suitable area for fish passage. The EPA has also found that such conditions are likely present when the Station operates as a peaking facility. The court describes these findings in more detail below.

An earlier pronouncement of the possibility of fish passage under or around a limited thermal plume in the Hooksett Pool appears in a 1991 memorandum written by an EPA Senior Permit Engineer regarding the Station. The engineer wrote that "[w]ith the arrival of the anadromous fish in a couple of years" the agency needed more "information on the correlation" between the Station's operations and the "in-stream thermal plume configuration and the concomitant fish blockage/passage . . . ."[132] The engineer added that zones of fish passage may exist "under or around the [Station's] thermal plume," but it was "not possible to determine" the existence of such passage ways at that time because "the regulatory agencies[ ] lack[ed] data that would define the plume

[132] Defs.' Ex. 2 at 3.

configuration (temperature distribution) in several vertical river cross-sections (fish passage ways)."[133]

Years later, in the 2020 Response to Comments, the EPA was able to test this theory of fish passage with the benefit of a "three-dimensional, hydrothermal computer model developed" by environmental consultants in 2010 "to predict the behavior of the thermal plume at baseload operations under 'average' and 'extreme' conditions based on [river] flow and upstream river temperatures."[134] Upon reviewing the model's predictions as well as temperature data, the EPA found that "an adequate zone of fish passage is likely available" under or around the Station's thermal plumes during the periods when alewife and American shad are migrating. Specifically, the EPA determined that

> [t]emperature data and thermal modeling indicate that in spring, when certain anadromous species, such as American shad, may be moving past the Facility, low ambient temperatures and higher river flows combine to ensure that an adequate zone of passage is likely available beneath the surface-oriented plume and on the eastern side of the river. Similarly, an adequate zone of passage exists under most conditions in fall when juvenile alewives may be migrating past the Facility. Under current operations (i.e., more like a peaking plant), the Facility operates at low capacity during spring and fall. However, neither the thermal modeling nor the actual temperature data clearly demonstrate that an adequate zone of passage is available under conditions when the Facility is operating at full capacity and ambient temperatures are highest (e.g., summer), particularly during years with low river flow.
> . . .
>
> Since 2012, however, the Facility operates infrequently in July and August and, when it does operate, it is typically for short durations (one week or less). If the Facility operates at high capacity during July and August in years with low flow

[133] Id.

[134] 2020 Response to Comments (Defs.' Ex. 9) at 109.

> and high ambient temperatures, resident fish may avoid moving past the Facility due to temperatures in the thermal plume. However, the Final Permit's operational limits will ensure that the duration of the event is limited such that protection and propagation of the BIP is assured.[135]

The EPA also reviewed daily temperature data under peaking operations during the migration period for alewife and shad. As part of this analysis, the EPA identified a shorter, and later, migration period than Dr. Jordaan did. As noted above, Dr. Jordaan opined that these fish migrate downstream from mid-June through October. The EPA, on the other hand, maintained that alewife and shad in the Merrimack River typically migrate from late August through October.[136]

The EPA did find that temperatures exceeded avoidance levels at Station S4 occasionally under peaking operations during the migration period, but these exceedances were sufficiently limited to permit fish passage, as well. Specifically, the EPA identified that mean and maximum daily temperatures at Stations S4 and S0 occasionally exceeded 28.9˚ C in August and September 2016, when the "capacity of the Station was, on average, 9%," but those "[e]xcursions of protective temperatures for juvenile alewives [we]re limited in duration and extent."[137] According to the EPA, "[t]his data suggests that, under current [peaking] operations, the thermal plume is unlikely to impact juvenile

[135] Id. at 111.

[136] Id. at 75.

[137] Id. at 77.

alewives because juveniles can avoid the plume and will not be excluded from potentially suitable habitat for extended periods of time."[138]

As for juvenile shad, the EPA considered mean and maximum daily temperature at Station S4 in 2018, "which is representative of average operation in August and September," and found that temperatures at S4 "rarely reached or exceeded protective temperatures for juvenile American shad[,] and exceedances that did occur were limited in duration."[139] The EPA subsequently concluded that "the thermal plume under current [peaking] operations is unlikely to impact juvenile American shad because juveniles are likely to avoid the plume for the limited period when it is present downstream of the discharge and will not be excluded from potentially suitable habitat for extended periods of time."[140] The EPA added that "American shad juveniles are mobile, and will likely avoid extreme temperatures that may occur in the relatively limited segment from S0 to S4."[141]

Dr. Barnthouse agreed with the EPA's definition of the migration period, as well as its conclusions regarding the availability of fish passageways under or around the thermal plume during peaking operations.[142] Dr. Barnthouse also offered quantitative evidence in support of the EPA's latter opinion. This evidence focused on the four periods when

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[138] Id.

[139] Id. at 78.

[140] Id.

[141] Id.

[142] See Trial Tr. 10.25.22 AM (Barnthouse) at 20:12-21:22, 35:3-5.

Hodge identified an extensive thermal plume—periods during which Dr. Jordaan also believed that fish passage was blocked. For each of these periods, Dr. Barnthouse used Hodge's linear regression model to calculate the average and maximum river temperatures at nine points on the transect, or cross-section, where the S4 temperature probe is placed—on the center, east, and west sides of the transect, and at the top, middle, and bottom depths. In other words, he calculated the average and maximum temperature on either side and below the S4 probe during each of the extensive thermal plume periods.

Dr. Barnthouse found that, for every period modeled, the average temperature on the east side of the S4 probe was always lower than avoidance levels, and "the maximum east side surface temperature at Station S4 exceeded the [a]lewife avoidance temperature only during [one] period[,] July 18-22, 2019."[143] Finally, Dr. Barnthouse determined that, during each period modeled, the average temperature at the middle and bottom depths of the S4 transect were always below avoidance temperatures.[144] With this evidence, Dr. Barnthouse concluded that, during each extensive plume, "at the surface of the river, a migration corridor for [a]lewife and shad would have been available on the east side of the river except on rare occasions," and alewife and shad could migrate in the middle or bottom of the river "unimpeded" by unfavorable temperatures.[145]

[143] Barnthouse Expert Report (Defs.' Ex. 35) at 9 (emphasis added).

[144] Id.

[145] Id.

Weighing the evidence. Having summarized the parties' positions, the court now considers which is more persuasive. The court begins with the parties' competing interpretations of the meaning of the subject Permit provision, as this will determine what activity is violative of the Permit. When interpreting the meaning of NPDES permits, contract interpretation principles apply. Piney Run Pres. Ass'n v. Cty. Comm'rs of Carroll Cty., 268 F.3d 255, 269 (4th Cir. 2001). Accordingly, the court must "first determine whether [the provision] is ambiguous." Id. at 269-70. "Contract language is usually considered ambiguous . . . where the phraseology can support reasonable differences of opinion as to the meaning of the words employed and obligations undertaken." Fashion House, Inc. v. K mart Corp., 892 F.2d 1076, 1083 (1st Cir. 1989)

The court considers the subject Permit provision ambiguous for at least three reasons. First, the Permit does not define the phrase "the zone of fish passage." Further, the term "block" has a relatively broad meaning, including "[t]o obstruct or close with obstacles (a passage),"[146] or to "make unsuitable for passage."[147] Finally, the court finds that both parties' interpretations of these terms are reasonable.

Indeed, the plaintiffs' narrow interpretation of the provision is based on Dr. Jordaan's credible expert opinion. He grounded his opinion in theories about fish biology that are both logical and not seriously refuted by the defendants—essentially, in

[146] Oxford English Dictionary, available at https://www.oed.com/dictionary/block_v1?tab=meaning_and_use#18033746.

[147] Merriam-Webster Dictionary, available at https://www.merriam-webster.com/dictionary/block.

attempting to avoid temperatures that are unfavorable, fish may stop migrating or face a delay or alteration in their migration route which could increase predation threats by slowing them down, forcing them to swim in areas where predators are more prevalent, and/or taxing their metabolism and ability to avoid predators. Dr. Jordaan's conclusion that these outcomes constitute blockage of fish passage is sound.

Meanwhile, the defendants source their interpretation of the Permit provision from the EPA itself—the permitting agency. The EPA's conclusion that fish passage is not blocked when fish are able to swim under or around the Station's surface-oriented plume is also rational and consistent with the experts' shared opinion that fish can respond to unfavorable temperatures through avoidance tactics. The EPA's opinion is also persuasive because it has been consistent over time, and it relies on relevant data and evidence. Specifically, the EPA acknowledged the possibility of fish passage below and around the Station's thermal plumes as early as 1991, and it confirmed the theory in 2020, using thermal modeling and temperature data reflecting the Station's more recent peaking operations.

Where, as here, a NPDES Permit provision is ambiguous, the court "must turn to extrinsic evidence to determine the intent of the permitting authority." Piney Run, 268 F.3d at 270. Naturally, when engaging in this inquiry, courts "give significant weight to any extrinsic evidence that evinces the permitting authority's interpretation of the relevant permit." Nat. Res. Def. Council, Inc. v. Cnty. of Los Angeles, 725 F.3d 1194, 1207 (9th Cir. 2013). Consistent with these principles, the court places significant weight on the EPA's interpretation of the Permit provision. Such deference is also warranted

under the Skidmore standard, due to the persuasiveness of the EPA's interpretation, as discussed in the previous paragraph, and for the reasons stated supra Section III.B.

The court now weighs the plaintiffs' evidence against the EPA's definition of the Permit provision. In other words, the relevant inquiry at this stage is whether the plaintiffs have proven, by a preponderance, that the Station's thermal discharges are likely to block the zone of fish passage by creating thermal conditions in, around, and under the thermal plume that are inhospitable to the migrating juvenile alewife and shad.

First, the court cannot find a Permit violation based on the plaintiffs' evidence of exceedances of thermal tolerance limits at S4 because the record indicates that these temperature readings are not informative of the thermal conditions beyond the probe itself. As previously noted, supra Section I.C, the S4 temperature probe captures surface water temperatures about 2,000 feet downstream of the of the Station's discharge point. When asked during cross-examination, Dr. Jordaan agreed that the data gathered at the S4 probe did not provide him with information about the temperature of the water beyond the specifical location of the probe.[148] He further testified, without further elaboration, that he "assume[d] . . . , based on all the information that [he] viewed," that the S4 probe's monitoring area "covers enough space to create a blockage of the zone of fish passage."[149]

[148] Trial Tr. 10.19.22 PM (Jordaan) at 93:7-9.

[149] Id. (Jordaan) at 93:14-22.

The plaintiffs did not attempt to strengthen this limited testimony with evidence suggesting that the S4 probe's monitoring area extends a meaningful distance across or beneath the pool's surface. Instead, the plaintiffs pointed to excerpts of the 2020 Response to Comments in which the EPA discussed the temperatures at the S4 probe as an indicator of whether or not the pool's thermal conditions were protective of migrating fish. This argument misrepresents the EPA's statements.

While the EPA did assert that repeated, high temperatures at S4 were "consistent" with the conclusion that the river conditions were not protective of migrating fish, it followed that assertion by "acknowledg[ing]" that fish "could potentially avoid higher temperatures [at S4] if the plume were sufficiently limited to allow areas of passage."[150] Further, as discussed above, the EPA repeatedly stated that fish passage was possible when S4 temperatures exceeded avoidance levels for limited durations. Based on the evidence before it, the court cannot conclude that the S4 temperatures reflect the thermal conditions under or around the Station's thermal plume and are thus indicative of the availability of fish passage through those areas.

The plaintiffs did provide evidence of two distinct week-long periods between July 19 and August 10, 2022, however, when S4 temperatures exceeded avoidance levels, and the cooler water was likely not available under or around the plume because ambient temperatures also reached or exceeded avoidance levels. This is compelling evidence that fish passage ways were not available under or around the Station's thermal plume

[150] See, e.g., 2020 Response to Comments (Defs.' Ex. 9) at 76.

during those periods. This is not adequate evidence of a Permit violation, however, if it occurred outside of the alewife and shad outmigration period. Thus, in order to determine the weight of this evidence, the court must first decide whether to credit the EPA's definition of the outmigration period (late August through October) over Dr. Jordaan's definition (mid-June through October).

In substantiating its definition of the outmigration period, the EPA acknowledged that juvenile alewife migrate "between June and November" in "most Atlantic coast populations."[151] The EPA found that the outmigration period in Merrimack River was later, however, based on data that was largely drawn from the Hooksett Pool—a United States Fish & Wildlife Service study; "historical fisheries data" that "suggest[ed] that young-of-year and adult alewives generally are not common in Hooksett Pool except during periods of out-migration, which typically occur in September or October"; and fish sampling data collected by Normandeau in 2006, which demonstrated that juvenile alewife were present in the pool in late August.[152] Dr. Jordaan, on the other hand, cited a few scientific studies to support his assessment of the alewife outmigration period, two of which pertained to trends in water bodies in Connecticut and Massachusetts.[153] The court finds the EPA's reasoning more convincing, as it is focused on the Hooksett Pool, instead of other water bodies. The court also credits the EPA's position due to its expertise, consistent with Skidmore. Thus, the plaintiffs' evidence of heightened temperatures in

[151] Id. at 75.

[152] Id.; EPA 2011 Determinations Document (Pls.' Ex. 3) at 121-22, 239-40.

[153] Rebuttal Report of Adrian Jordaan ("Jordaan Rebuttal Report") (Pls.' Ex. 20) at 19.

the July 19-August 10, 2022 period does not effectively prove a Permit violation because this period likely did not overlap with the outmigration of alewife and shad.

Finally, the court is not persuaded by Dr. Jordaan's opinion that fish passage is blocked when the Station's discharges create what Hodge considers an extensive thermal plume, for at least two reasons. First, as discussed supra Section III.C, the court does not find Hodge's concept of an extensive thermal plume to be sufficiently credible to prove a Permit violation. Second, Dr. Jordan's conclusion was at least partially disproven by Dr. Barnthouse's determinations that whenever an extensive plume was present according to Hodge, the water below or around the S4 probe was almost always cooler and hospitable to fish passage. Critically, Dr. Barnthouse based this conclusion on the results of a regression model developed by Hodge, the plaintiffs' own expert. Accordingly, the plaintiffs do not meaningfully challenge Dr. Barnthouse's approach for estimating the temperatures surrounding the S4 probe.

The court recognizes that Hodge's model may present flaws that weigh against the reliability of the regression results. Dr. Barnthouse calculations nevertheless provide some evidence that further weakens Dr. Jordaan's already unadorned and insufficiently persuasive opinion on this matter. The court concludes that the purported past or future presence of extensive thermal plumes does not meaningfully support a finding of ongoing violations of the Permit as alleged in Count 1.[154]

[154] Dr. Jordaan provided one more opinion regarding fish blockage and the impact of temperature on the fish in the pool, but the court finds it wholly unpersuasive. Nevertheless, the court takes this opportunity to briefly describe the opinion and its pitfalls. Dr. Jordaan selected four periods "with adequate data . . . to illustrate the consequences of the thermal plume." Jordaan Expert

Conclusion. In sum, the plaintiffs have not provided evidence that persuades the court, by a preponderance, that the Station is likely to violate the Permit by blocking the zone of fish passage under the EPA's definition of the subject Permit provision. The plaintiffs accordingly do not prevail on Count 1.

E. Balanced indigenous population (Count 2)

In Count 2, the plaintiffs allege continuing violations of Part I.A.1.g(b) of the Permit, which prohibits the Station from "chang[ing] the balanced indigenous population of the receiving water." The parties agree that the phrase "balanced indigenous population" ("BIP") is defined in an EPA regulation as follows:

> The term balanced, indigenous community is synonymous with the term balanced, indigenous population in the [CWA] and means 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

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Report (Pls.' Ex. 19) at 14. These periods spanned from June through September 2018 and July through September 2019. Id. For each multi-day period, Dr. Jordaan identified the maximum Delta-T value at A00 and the maximum temperature reached at N10. He then summed these values; according to Dr. Jordaan, the resulting number demonstrated the "impact [that] would have been experienced by every fish within the downstream section of the Hooksett Pool." Id. For each of the four periods, Dr. Jordaan found that the sum of these values reached the lethal limit for adult and/or juvenile alewife. See id. at 15-19. Dr. Jordaan stated that "there's a lot of opportunity for the two temperatures to converge, [though] perhaps not precisely." Trial Tr. 10.19.22 PM (Jordaan) at 97:2-5. He did not credibly or definitively assert that the maximum N10 value and the maximum Delta-T value at A00 occurred at the same time, however, nor did he suggest the frequency or duration of such convergence(s). Id. (Jordaan) at 97:6-9 ("Q. Well, without knowing when A00 was at its max during this period, you don't know when [the maximum N10 and A00] temperatures may match up, if ever; is that right? A. That is true."). Furthermore, Dr. Jordaan did not provide clarity on the purpose of his calculation at trial; instead he testified that this exercise "represent[ed] a worst-case scenario based on some assumptions." Id. at 96:15-20. Thus, it is not clear how, if at all, the sum of these values is a realistic representation of the thermal conditions in the Hooksett Pool at any time during the selected periods. The court accordingly discounts this portion of Dr. Jordaan's opinion.

> 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 Act; and may not include species whose presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a).

40 C.F.R. 125.71(c).[155] The court applies this agreed-upon definition when assessing this claim.

The EPA discussed the impact of the Station's discharges on the Hooksett Pool BIP in the 2011 Determinations Document and the 2020 Response to Comments. In 2011, the EPA determined that the Station's discharges caused "appreciable harm" to the BIP. In 2020, however, the EPA observed that the status of the BIP had improved since the Station reduced its operations and began functioning as a peaking facility. The EPA concluded in 2020 that the Station's discharges were protective of the BIP, and the 2020 Permit requirements would ensure continued protection of the BIP. The parties focused heavily on the EPA's analysis and conclusions on this matter during trial—specifically, the plaintiffs relied on the EPA's 2011 findings, and the defendants relied on the EPA's 2020 findings. The plaintiffs also set forth a range of evidence that they argue indicated that the Station continues to harm the pool's BIP, while the defendants set forth evidence that the Station has complied with the 2020 Permit, and thus continues to protect the BIP.

[155] The parties agree that the Permit does not define the phrase "balanced indigenous population," but the phrase "balanced indigenous community" is defined in the cited EPA regulation. See doc. no. 93 at AF ¶¶ 19-20.

The EPA's conclusion in 2020, if credited, weighs heavily against the likelihood of ongoing violations of this Permit provision. Accordingly, the fate of this claim largely turns on the weight of the EPA's determination in 2020, as compared to evidence that (according to the plaintiffs) contradicts and undermines that determination.

The court begins by summarizing the EPA's analysis and conclusions regarding the status of the BIP in 2011 and 2020 and assessing the weight of these agency findings. Then, the court describes and evaluates the strength of the defendants' evidence of the Station's compliance with the 2020 Permit, and the plaintiffs' evidence of harm to the BIP. Based on a comparison of the competing evidence, the court finally concludes that the plaintiffs have not sustained their burden to prove ongoing violations of this Permit provision.

1. The EPA's assessment of the status of the BIP

The EPA's 2011 findings. In 2011, the EPA found that "compelling evidence [shows] that [the Station's] thermal discharge, possibly in combination with other impacts on the affected species, has appreciably harmed the balanced, indigenous community in Hooksett Pool."[156] The EPA largely relied on two categories of evidence to draw this conclusion—data from sampling activities conducted in the Hooksett Pool over time, and two decades of daily temperature data gathered from the monitoring stations at N10, S0, and S4.

[156] 2011 Determinations Document (Pls.' Ex. 3) at 149.

The EPA began with the premise "that the relevant balanced, indigenous community is comprised of all species that existed in Hooksett Pool immediately prior to the start-up of Unit 1 [of Merrimack Station], in 1960."[157] "[C]omprehensive biological sampling" in the pool was first conducted in 1967, however—seven years after Unit 1 began operating and one year before the start-up of Unit 2.[158] The EPA accordingly decided that "the resident biotic community identified during sampling conducted from 1967 to 1969 [was the] best represent[ation] [of] the [pool's] balanced, indigenous community . . . because the 1967-1969 data [was] the earliest data available, and because the volume of heated cooling water discharged into Hooksett Pool more than tripled in 1968 after Unit 2 came on line."[159]

When the EPA made its 2011 determinations, it had access to fish sampling data that was collected intermittently from the late 1960s and early 1970s through 2005. The EPA compared the newest and oldest data, and it found "several conspicuous pieces of evidence" demonstrating "appreciable harm" to the pool's fish community over this period.[160] For example, the EPA found a 94 percent decline in the "[a]bundance for all species combined that comprised Hooksett Pool's balanced, indigenous community" between the 1960s and the 2000s; "[a] calculated Bray-Curtis Percent Similarity Index[161]

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[157] Id. at 64.

[158] Id.

[159] Id.

[160] Id. at 149.

[161] In the 2011 Determinations Document, the EPA described, and credited, PSNH's explanation of the Bray-Curtis index. This index "computes percent similarity among the fish taxa common

of 23.2 percent when comparing [the] Hooksett Pool fish community of the 1970s with that of the 2000s," meaning that "the fish communities of the 1970s and 2000s [were] dissimilar by 72.8 percent"; and a shift from a mix of warm and coolwater fish in the 1960s and early 1970s "to a community dominated by thermally tolerant species . . . in the 1990s and 2000s."[162] The EPA also noted a decline in the population abundance of three "residential, indigenous species"—pumpkinseed, white sucker, and yellow perch.[163] According to the EPA, pumpkinseed was "the most abundant fish species in 1967" but had "virtually disappeared" by the mid-2000s;[164] white sucker abundance fell from 18.2 percent in the 1970s to 2.1 percent in the 2000s;[165] and yellow perch "abundance in Hooksett Pool significantly declined between 1967 and 2005."[166]

After identifying this shift in the pool population, the EPA reviewed thermal studies analyzing the configuration of the Station's thermal plumes, as well as temperature data collected at N10, S0, and S4 from 1984 through 2004, to confirm whether the population changes could be attributed to the Station's discharges, as opposed to the other "natural and anthropogenic stressors" that can cause "appreciabl[e]

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in two sets of survey data . . . ." Id. at 104. "The closer the Bray-Curtis value is to 100%, the more similar the two communities are." Id. at 105.

[162] Id. at 150.

[163] Id. at 66.

[164] Id. at 133, 150.

[165] Id. at 145.

[166] Id. at 150.

harm."[167] Based on the thermal studies, the EPA concluded that the "capacity of the [Station's] thermal discharge to adversely impact the balanced, indigenous community of Hooksett Pool is significant."[168] Specifically, the EPA noted that "[t]hermal studies conducted by Merrimack Station since the 1960s" established that the "plume's configuration is affected by river flow."[169] "During summer low-flow conditions, Merrimack Station's thermal plume can extend" across "approximately 50 percent of the surface area of Hooksett Pool."[170] Furthermore, "most, if not all, of the shallower areas along the shorelines"—which are "widely recognized as important habitat for juvenile fish"—"can be affected by the thermal plume downstream from the discharge."[171]

Finally, the EPA compared daily temperature data against the thermal tolerance levels of Hooksett Pool fish species at various times of year and life stages, as reported in scientific literature. The EPA observed that the temperatures in portions of the pool repeatedly exceeded certain fish species' tolerance levels when those fish were present, further supporting its conclusion that the Station's discharges harmed the pool's BIP. For example, the EPA found that "American shad larvae drifting past Station [S0] as early as May 26 could be exposed to temperatures" that can be lethal,[172] and " yellow perch larvae

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[167] Id. at 151.

[168] Id.

[169] Id. at 71-72.

[170] Id. at 151.

[171] Id. at 72, 152.

[172] Id. at 125.

were [likely] exposed to potentially lethal temperatures within Merrimack Station's thermal plume" when they were likely present around May and June of some years.[173] The EPA found further evidence of unfavorable thermal conditions prior to 2011 in "daily temperature data from 2004 through 2011[,]" which "indicate[d] that the mean and maximum S0 and S4 temperatures steadily exceed [the avoidance temperature for yellow perch juvenile and adults] between June 15 and September 10 in most years."[174]

The EPA's 2020 findings. As previously discussed, the EPA did not issue the 2011 Draft Permit, and instead reopened the public comment period and drafted a new Permit, in part to address the Station's transition in 2012 from a baseload to a peaking facility. As part of this process, the EPA re-assessed the effect of the Station's thermal discharges on the pool's BIP and reported its findings in the 2020 Response to Comments.

Once again, the EPA relied on fish sampling and temperature data for its analysis. This time, the EPA had access to more recent, daily temperature data from 2004 through 2019, as well as fish sampling data collected by Normandeau each year from 2010 to 2013—a period that coincided with the Station's transition from a baseload to a peaking facility.[175] The new fisheries data "provide[d] the first ever comparisons between the Hooksett Pool fish community and that of the [upstream] Garvins Pool," two "adjacent" and "similar," though "not . . . identical[,] waterbodies," the latter of which does not

[173] Id. at 137-38.

[174] 2020 Response to Comments (Defs.' Ex. 9) at 80.

[175] Id. at 97, 216.

receive thermal discharge from the Station.[176] With this additional information, the EPA had two "acceptable representation[s] of the proper [balanced, indigenous population]"—the Hooksett Pool fish community of the 1970s as well as the Garvins Pool fish community.[177]

According to the EPA, the new "fish community" data did not change its prior "conclusions regarding the status of the BIP as of 2005," but the new data did "suggest [that] conditions [had] improved in Hooksett Pool."[178] For example, the EPA found that the "proportion of coolwater to warmwater species in Hooksett Pool [ ] increased" from the 1970s to the 2010-13 period, and "the balance of warmwater and coolwater fish species . . . that comprise[d] the Hooksett Pool fish community [as of 2013] [was] comparable to the community that existed in the 1970s."[179] Similarly, the "EPA reviewed the breakdown in coolwater and warmwater species relative abundance for Garvins and Hooksett Pools over the sampling period 2010-2013 and found, on average, the two pools have very similar proportions of warmwater and coolwater species."[180] According to the EPA, this finding was "consistent with" the conclusion that "the Hooksett Pool fish community is in similar condition to the upstream Garvins Pool fish community."[181]

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[176] Id. at 216.

[177] Id. at 210.

[178] Id. at 261.

[179] Id.

[180] Id. at 234.

[181] Id.

Further, though the EPA found a "notable decline in fish abundance from both temperature guilds between the 1970s and the 2010s," it also noted that the sampling data from 2010-13 did not indicate "a decreasing trend in abundance for coolwater species," further suggesting that "thermal conditions in Hooksett Pool may be improving for the resident species most sensitive to elevated temperatures . . . ."[182]

According to the EPA, its review of "mean daily and maximum daily temperature data during the years 2004 through 2019" revealed further evidence that thermal conditions in the pool were improving under peaking operations.[183] The EPA found that "when operating as a baseload plant, the thermal plume from the Station frequently exceeded protective temperatures over multiple days and in consecutive years"; by contrast, "[t]emperature data from more recent years when the Facility has operated like a peaking plant[] show[ed] lesser and less frequent instances of water temperatures exceeding protective levels."[184] For example, "in 2016, which is representative of above average operating capacity compared to recent summers[,] the mean and maximum daily temperature at Station S0 only occasionally reached or exceeded avoidance temperatures for yellow perch[,] and exceedances that did occur were limited to a few days."[185] Similarly, the EPA observed that, under peaking operations, "Merrimack Station operates infrequently in August and September," and "in August and September 2016[,] . . .

[182] Id. at 235, 240.

[183] Id. at 97.

[184] Id. at 97-98.

[185] Id. at 81.

[e]xcursions of protective temperatures for juvenile alewives [at S0 and S4] [we]re limited in duration and extent."[186]

The EPA concluded, based on the above "evidence of improvement, which correspond[ed] with the [Station's] reduced operations," that "the Hooksett Pool BIP will be protected now and in the future if the Final Permit includes a combination of operational and temperature limitations that ensure Facility operations maintain current operational levels . . . ."[187] The EPA further found that the "combination of operational and temperature limitations" in the 2020 Permit will "assure the [continued] protection and propagation of the BIP."[188] The EPA specified that the 2020 Permit includes "limits on operation, in combination with acute (maximum daily), water quality-based temperature limits at Station S4, [which] will ensure that the impacts of the thermal plume are limited in duration and severity such that the BIP is protected," and that the Station cannot "simply shift to higher level operations, such as baseload operations."[189]

Deference owed to the EPA's 2011 and 2020 findings. To begin, the EPA's 2011 finding that the Station harmed the BIP in the past warrants significant weight and deference under the Skidmore standard. Indeed, the EPA's conclusion on this technical matter is within its expertise. It is also persuasive, as it is the product of extensive consideration and analysis of fish species' thermal tolerance, temperature data, and

[186] Id. at 77.

[187] Id. at 261.

[188] Id. at 39.

[189] Id. at 105, 137.

fisheries data. Furthermore, during trial, the defendants' expert, Dr. Barnthouse, agreed with two of the EPA's key conclusions from its 2011 BIP analysis. Dr. Barnthouse testified that "the capacity of the [S]tation's thermal discharge to adversely impact the [balanced, indigenous community] [was] significant" as of 2011,[190] and "there was a shift from" the fish community present in the late 1960s or early 1970s to "what appears to be a more heat-tolerant community" by 2011.[191]

The EPA's findings regarding the status of the BIP in 2020 are also worthy of significant deference, for the very same reasons—the findings concern technical matters and are the product of the EPA's expertise and reasoned analysis of relevant data. The court is particularly persuaded by the EPA's logical and comprehensive review of the data available to it.

For example, when reviewing temperature data, the EPA focused on daily and short-term averages instead of long-term averages. The EPA acknowledged that its "consideration of the actual, daily temperature data is consistent with comments received from" the plaintiffs in this case, which urged the EPA to "consider the long-term, comprehensive continuous monitoring data for the three locations in the Merrimack River [Stations N10, S0, and S4], instead of relying on high-level summaries that hide peak temperatures and variation over time."[192] Further, the EPA reasonably took into consideration the Station's shift in operations in 2012 when assessing the relationship

[190] Trial Tr. 10.25.22 PM (Barnthouse) at 82:3-7.

[191] Id. (Barnthouse) at 82:8-17.

[192] 2020 Response to Comments (Defs.' Ex. 9) at 62 n.6.

between the Station's discharges and the BIP. The EPA did this by reviewing fish sampling and temperature data from 2012 and afterwards, and comparing it with fish sampling and temperature data from earlier periods. Finally, before setting temperature limits for the 2020 Permit, the EPA considered a "wide range of studies to determine appropriate temperatures for protecting the BIP.[193] The temperature limits also complied with the EPA's "1986 Water Quality Criteria ("Gold Book"), which establishes a maximum protective temperature for short exposures based on species-specific equations."[194]

In considering the persuasiveness of the EPA's 2020 determinations, the court also finds it noteworthy that Dr. Jordaan expressed agreement with at least one aspect of the EPA's analysis. He testified, consistent with the EPA's opinion, that the Hooksett and Garvins Pools "are reflective of each other," and the similarities that the EPA found in the fish communities in the pools "provides evidence on the side of supporting th[e] [EPA's] finding" that the BIP is currently protected.[195] In sum, the EPA's 2020 findings are well-reasoned, thorough, supported by relevant data and evidence, and internally consistent, and the court accordingly places significant weight on them.

In deferring to the EPA's 2020 determinations, the court recognizes that they are not necessarily final, nor are they impenetrable. For example, the plaintiffs raise at least three reasonable challenges to the EPA's conclusion that the 2020 Permit requirements

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[193] Id. at 95.

[194] Id.

[195] Trial Tr. 10.20.22 AM (Jordaan) at 99:21-100:12.

will ensure the protection of the BIP. These challenges bear some (though not commanding) weight, and are thus worth noting in brief.

First, the plaintiffs suggest that the EPA's 2020 determinations are based on insufficient fish sampling data from the period following the Station's transition to a peaking facility. The court agrees that the EPA only had two years of fish sampling data (from 2012 and 2013) on which to conclude that the status of the BIP was improving and protected under peaking operations. This two-year period can be considered relatively limited in duration, but that does not necessarily negate the accuracy or importance of the observations that the EPA drew from the data.

The plaintiffs' concerns about the limited fish sampling data reflecting peaking operations are also mitigated by two facts that are apparent from the record. First, Part I.C of the 2020 Permit is presently in effect and requires two consecutive years of fish sampling.[196] This sampling commenced in 2022 under a sampling plan that the defendants developed and the EPA approved.[197] Second, the EPA has shown a willingness to adjust Permit requirements based on new data or changed circumstances. Indeed, the EPA reopened the public comment period to address the Station's operational changes in 2012, and it stated in the 2020 Response to Comments that, "[i]f it turns out

[196] 2020 Permit (Defs.' Ex. 8) at Part I.C; see also Pls.' Ex. 71 at 3 (identifying the 2020 Permit provisions that are stayed, and those that are uncontested and fully effective as of October 1, 2020).

[197] See Approved Sampling Plan (Defs.' Ex. 97); Trial Tr. 11.2.22 AM (Tillotson) at 7:15-8:10 (confirming that the EPA reviewed and approved the defendants' fish sampling plan); Trial Tr. 11.7.22 AM (Varney) at 49:4-22 (confirming that fish sampling as required under Part I.C of the 2020 Permit commenced in July 2022).

that the Final [2020] Permit's thermal discharge limits are not adequately protective, they can be appropriately tightened in the future."[198] These facts inspire at least some confidence that the EPA will consider newly gathered fish sampling data and adjust Permit requirements accordingly.

Next, the plaintiffs argue that the Delta-T and Capacity Factor Alternative Compliance Conditions cannot be protective of the BIP because the former lacks a proper foundation and the latter was remanded by the EAB because the EPA "failed to provide adequate notice" of the condition before issuing the 2020 Permit.[199] While these arguments are not unreasonable, they do not persuade the court to significantly discount the EPA's 2020 determinations, for the reasons stated below.

To begin, the EPA provided at least some reasoning for both of these Alternative Compliance Conditions in the 2020 Response to Comments. The EPA explained that the Delta-T condition "provides the Permittee with flexibility to meet the effective permit limits when ambient temperatures in the river may reach or exceed" them and also "addresses" the possibility that fish have higher thermal tolerance levels than reflected in laboratory studies.[200] Relatedly, the EPA recognized that fish may sometimes withstand higher temperatures than those reported in studies, as "laboratory studies of temperature tolerance acclimate fish at a constant temperature, but under natural conditions fish are

[198] 2020 Response to Comments (Defs.' Ex. 9) at 332.

[199] EAB Remand Order (Pls. Ex. 72) at 37.

[200] 2020 Response to Comments (Defs.' Ex. 9) at 157.

exposed to a range of temperatures," including higher acclimation temperatures during warm weather, which "typically correspond with higher temperature tolerances."[201]

As for the Capacity Factor condition, the EPA explained that "[a] rolling, 45-day average capacity factor of 40% from May 1 through September 30 allows the Facility to continue to operate during the summer as it has in recent years (in fact, in most years the 45-day average capacity factor was less than 40%) while limiting the impacts of the thermal plume on the aquatic community."[202] The EPA further explained why it selected a 45-day period for the Capacity Factor condition, and not a longer or shorter period, as follows. "A 45-day rolling average strikes a balance between limiting the number of days a facility can operate in a row and requiring sufficient 'downtime' when the Facility is not operating to allow the river to recover to ambient temperatures."[203] Neither of these rationales are extensive, but they warrant some deference under Skidmore as products of the EPA's expertise on matters of a highly technical nature.

The plaintiffs, meanwhile, marshalled extremely limited evidence challenging the substance of these conditions at trial. The plaintiffs questioned Dr. Barnthouse about the Delta-T Alternative Compliance Condition, and he testified that he did not "have" a biological or scientific basis for the 2˚ C buffer reflected in the condition, and he did not know where the buffer "came from."[204] Aside from this testimony, the plaintiffs did not

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[201] Id. at 153.

[202] Id. at 39 n.4.

[203] Id.

[204] Trial Tr. 12.2.22 PM (Barnthouse) at 47:2-9.

set forth any expert opinions critiquing the two conditions. Without more, and more specific, expert opinions weighing against the validity of these two conditions, the plaintiffs' attempts to invalidate these aspects of the Permit are of limited persuasive effect.

2. The defendants' evidence

As previously noted, in countering the plaintiffs' claim, the defendants rely in large part on the EPA's 2020 findings that the BIP will remain protected under the Station's peaking operations and the 2020 Permit requirements. The defendants also presented credible evidence demonstrating that the Station has complied with the 2020 Permit requirements since 2020.

The defendants entered into evidence an exhibit that summarizes the Station's capacity factor as well as temperature data gathered at the monitoring probes in the pool, and compares this data to the 2020 Permit's thermal and operational limits. The chart focuses on four compliance criteria in the 2020 Permit—the weekly average temperature limits, the daily maximum temperature limits, the 45-day Capacity Factor Alternative Compliance Condition, and the Delta-T Alternative Compliance Condition.[205] The chart also focuses on the periods of May through September of 2018 through 2021, as well as May through June of 2022. These years reflect the period since the defendants assumed ownership of the Station, and May through September covers the months when the maximum daily temperature limits and the Capacity Factor Alternative Compliance

[205] See Defs.' Ex. 31.

Condition apply.[206] The chart indicates that capacity factor data was not yet available for the period beginning in July 2022, and certain temperature data was not yet available for the period beginning in August 2022.[207] Thus, the chart does not contain the necessary information to determine compliance after June 2022.

Elizabeth Tillotson, the Vice President of the defendant organizations,[208] testified that she completed the calculations in chart,[209] and she explained how she completed them. She gathered data on the Station's capacity factor from the EPA's Clean Air Markets Program Database, a publicly available database that catalogues power plant emissions, including the variable she used, which captures gross generation.[210] She calculated the average weekly and maximum reported daily temperatures using the 15-minute temperature data gathered at both stations.[211] She also followed the 2020 Permit's instructions regarding how to calculate the Station's 45-day average capacity factor, weekly average temperatures, and daily maximum temperatures.[212]

The chart shows that the defendants have complied with the 2020 Permit's thermal limits from May through September of 2020 and 2021, as well as May through June of

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[206] Trial Tr. 11.2.22 AM (Tillotson) 12:8-14, 14:12-18.

[207] See Defs.' Ex. 31 at 6.

[208] Doc. no. 93 at AF ¶ 11.

[209] Trial Tr. 11.2.22 AM (Tillotson) at 10:23-24.

[210] See Clean Air Market Program Data, available at https://campd.epa.gov/data/custom-data-download; Trial Tr. 11.2.22 AM (Tillotson) at 11:11-16.

[211] Trial Tr. 11.2.22 AM (Tillotson) 11:9-10.

[212] Id. (Tillotson) at 14:19-24, 15:11-17, 18:22-19:4, 20:4-12.

2022. During any period in which weekly temperature limits were exceeded, the Permit conditions were still satisfied under the Capacity Factor or Delta-T Alternative Compliance Conditions. The plaintiffs do not meaningfully challenge Tillotson's calculations or underlying data for these periods, and the court finds both to be reasonable and reliable.

3. The plaintiffs' evidence

The plaintiffs presented a variety of evidence in an attempt to prove that the Station's thermal discharge continues to harm the BIP, contrary to the EPA's determination in 2020. Below, the court summarizes the more substantial evidence offered by the plaintiffs and assesses its persuasiveness.

First, Dr. Jordaan testified that the Station's shift to peaking operations did not bring about "an improvement in any way" because it "replaced one negative impact, which was the chronic exposure to high temperatures[,]" with another—"frequent[,] very high change[s] in temperature . . . in the summer and winter months while [ ] Merrimack Station is running."[213] According to Dr. Jordaan, these "rapid thermal changes," which are referred to as heat or cold shock, "ha[ve] a range of physiological and behavioral consequences from short term impairment to death."[214] Dr. Jordaan also asserted that heat and cold shock favor thermally-tolerant fish species, as those species are best able to "cope with [these] wild temperature changes."[215]

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[213] See 10.19.22 PM Trial Tr. (Jordaan) at 23:2-10, 63:23-64:1.

[214] Jordaan Expert Report (Pl. Ex. 19) at 6.

[215] 10.19.22 PM Trial Tr. (Jordaan) at 23:10-11; Jordaan Expert Report (Pl. Ex. 19) at 23.

Dr. Jordaan provided examples of these purportedly rapid temperature swings during both summer and winter. For example, in the summer, Dr. Jordaan identified "frequent changes of greater than 1˚ C [per hour] both in increases and decreases" at Station S4 on July 19, 2019.[216] He also opined that fish that enter the cooling canal when the Station is not operating can face more severe temperature swings and lethal temperatures when operations commence.[217] As for the winter months, temperature data recorded at Station S0 indicated that "plant operations during the winter cause temperature spikes that frequently exceed[ed] 10˚ C[elsius]" in 2019.[218]

The court credits this sound evidence of occasional temperature swings, as well as Dr. Jordaan's opinion that they can create detrimental conditions for fish during peaking operations. This evidence is minimally persuasive when it comes to demonstrating a Permit violation, however, because the plaintiffs do not effectively establish that the temperature swings affect, or are likely to affect, the BIP.

Indeed, several statements in Dr. Jordaan's report indicate an uncertainty about the impact of temperature swings on the fish in the pool. He wrote in his report that "[t]he extent and impact of these rapid temperature changes has not been detailed in any past work, nor have the extent or persistence of thermal plumes."[219] He also asserted that the temperature swings "will impact coldwater species more," and he provided examples

[216] Jordaan Expert Report (Pl. Ex. 19) at 23.

[217] Id.

[218] Id. at 10.

[219] Id. at 11.

of potentially harmful temperature swings in July and August of certain years, but he also suggested that coolwater species may not be present in the Hooksett Pool during those two months because the "background thermal conditions" would likely not "support" them at that time of year.[220]

The effect of temperature swings in the winter is similarly unspecified. Dr. Jordaan acknowledged that "[t]he impact of altered thermal regime," including temperature swings, "during the winter is far less certain, since no monitoring for the extent of the plume has occurred" in the winter.[221] He also wrote in his report that "fluctuations in temperature during winter months are more severe," but "research suggests that absolute temperatures are more impactful for heat and cold shock effects, thus the timing and background temperatures and which species are present will be important in determining impacts. In short, while data is lacking, there is reason to think that the rapid temperature swings caused by the Merrimack Station's winter operations harm native coldwater species such as brook trout and blacknose dace."[222]

The EPA's 2020 Response to Comments contains additional, credible evidence that weakens the force of Dr. Jordaan's opinion with respect to cold shock in the winter, specifically. The EPA opined that the effect of cold shock in the winter is limited when the Station operates as a peaking plant, since there is "minimal to no need for the facility to operate during much of the fall[,] . . . [and] [t]his allows resident species to adjust

[220] Id.

[221] Id. at 23.

[222] Id. at 11.

naturally to colder ambient temperatures throughout the Hooksett Pool."[223] As a result, the EPA reasoned, "the potential for cold shock to occur would be limited to only those fish within the [cooling] canal and not the Hooksett Pool proper where the plume's temperature drops fairly quickly as it comes in contact with the ambient river water and dissipates."[224] Dr. Jordaan testified at trial that he agreed with this conclusion.[225]

In short, Dr. Jordaan's opinion regarding the relationship between temperature swings and the status of the BIP lacks clarity and borders on speculative. As a result, the plaintiffs lack persuasive evidence that the occurrence of temperature swings in the Hooksett Pool in the summer and winter constitutes a likely Permit violation.

Second, the plaintiffs contend that the Station's discharges have changed or harmed the BIP by bringing about an invasive Asian clam population in the thermally-affected portions of the pool. As support for this argument, the plaintiffs point to the EPA's findings and comments within the 2020 Response to Comments. The EPA asserted that the Asian clam is "an invasive species with an affinity for warmer water temperatures than typically found in the Merrimack River under ambient conditions."[226] It also found that "quantitative" and "semi-quantitative" sampling from 2014 and 2016 revealed that Asian clams were "presen[t] throughout the thermally-influenced portion of Hooksett

[223] 2020 Response to Comments (Defs.' Ex. 9) at 137.

[224] Id.

[225] See Trial Tr. 10.20.22 AM (Jordaan) at 74:24-75:20.

[226] 2020 Response to Comments (Defs.' Ex. 9) at 269.

Pool," and were "absen[t] in the ambient area directly upstream."[227] The EPA was accordingly "convinced that the abundance of Asian clams in the thermally-influenced portion of the Hooksett Pool . . . is directly related to the [the] Station's thermal discharge."[228]

Critically, the EPA concluded that the "Asian clam has the potential to adversely alter the BIP of the Hooksett Pool" by, for example, competing with "native fish and shellfish species for food and space," but "based on the information provided to date, it appears that the effects associated with the Asian clams' presence and abundance has not caused appreciable harm to the . . . BIP."[229] The EPA partially based this conclusion on a commenter's analysis of the "differences in the abundance and species richness in native invertebrates upstream and downstream of the Facility's thermal discharge."[230] Finally, the EPA noted that the effect of Asian clam population on the BIP will be monitored under the 2020 Permit.[231]

As an initial matter, the EPA's conclusions are entitled to deference based, at the very least, on the EPA's expertise, the technical nature of this matter, and the EPA's reliance on at least some relevant evidence. See supra Section III.B. On balance, the EPA's conclusions weigh heavily against the plaintiffs' position. The EPA's statements

[227] Id. at 268, 271.

[228] Id. at 271.

[229] Id. at 270 (emphasis added).

[230] Id.

[231] Id. at 271.

regarding the Asian clam's potential ability to harm the BIP and the importance of monitoring the population lend some limited support to the plaintiffs' argument. But these statements are less definitive than the EPA's determination that the clams are not yet harming the BIP. Moreover, the plaintiffs do not offer expert testimony refuting the EPA's conclusion that the BIP remains protected currently, despite the presence of Asian clams. Indeed, Dr. Jordaan does not provide any opinion on the Asian clam population in the lower Hooksett Pool.[232] Nor do the plaintiffs offer convincing evidence that the very presence of the clams constitutes a change, or harm, to the BIP. As such, evidence of the presence and abundance of the Asian clam population does not advance the plaintiffs' claim.

Third, Dr. Jordaan considered a subset of the available fish sampling data to conclude that "warm water fish are favored in the Hooksett Pool."[233] He stated that the pool has a "low diversity of species . . . compared to other river reaches[,] and . . . [is] domina[ted] by thermally tolerant non-native species, although cold water species are present upstream and in tributaries."[234] Dr. Jordaan further noted that the "most abundant fish in the Hooksett Pool are those with the highest thermal optimal and lethal limits."[235] According to Dr. Jordaan, these population characteristics indicate that the pool provides

[232] See Jordaan Expert Report (Pls.' Ex. 19) (containing no opinion on the Asian clam population); Jordan Expert Rebuttal Report (Pls.' Ex. 20) (same).

[233] Jordaan Expert Report (Pls.' Ex. 19) at 21.

[234] Id. at 11.

[235] Id. at 7.

a "low quality environment in which [some fish species inhabiting the Merrimack River] cannot survive and reproduce to become self-sustaining."[236]

The court places little weight on this portion of Dr. Jordaan's opinion because it rests on less comprehensive and less recent fish sampling data than the EPA's contradictory findings. See Ferrara & DiMercurio v. St. Paul Mercury Ins. Co., 240 F.3d 1, 9 (1st Cir. 2001) ("When the factual underpinning of an expert opinion is weak, it is a matter affecting the weight and credibility of the testimony—a question to be resolved by the jury" (quoting Newell P.R., Ltd. v. Rubbermaid Inc., 20 F.3d 15, 21 (1st Cir. 1994))). Specifically, Dr. Jordaan did not incorporate Normandeau's 2010-13 fish sampling data into his analysis. Instead, Dr. Jordaan drew his conclusions from fish sampling data gathered by the New Hampshire Fish and Game Department and from Normandeau's 2011 analysis, which was limited to sampling conducted during or before 2005.[237]

Dr. Jordaan testified about the differences among these data sources and the relative superiority of Normandeau's 2010-13 fish sampling data at trial. He agreed that Normandeau's 2010-13 sampling is "intensive," and the NHF&GD sampling he relied on was "extensive."[238] In Dr. Jordaan's words, intensive sampling involves "significant effort in a single location," whereas extensive sampling involves "one pass or limited sampling but in a larger extent of area."[239] He also testified that Normandeau's 2010-13

[236] Id. at 11.

[237] Id. at 7.

[238] Trial Tr. 10.20.22 AM (Jordaan) at 67:14-20.

[239] Id. (Jordaan) at 66:16-21.

study was "the most intensive sampling available" and "the best [evidence,] of what has been done thus far."[240]

Nevertheless, Dr. Jordaan did not incorporate this evidence into his analysis of the fish population in the Hooksett Pool.[241] This oversight of admittedly reliable and valuable data severely undermines Dr. Jordaan's opinion because, based on the EPA's credible analysis, the 2012-13 sampling data reveals improvements in the BIP associated with the Station's peaking operations. In other words, Dr. Jordaan's opinion lacks credibility because he declined to confront important, relevant data that weighs against his conclusions.

Fourth and finally, the plaintiffs point to temperature data from 2018 through 2022, which they contend shows that the Station's operations caused temperatures in the pool to rise in a manner that taxes fish and is harmful to the BIP. For example, Dr. Jordaan credibly asserted in his report that in July 2019, the Station operated for 140 hours, and the average difference in temperature between N10 and S4 was 1.41˚ C.[242] He further explained that "[t]he biological consequences of a 1-2˚ C change in average summer water temperatures are significant both as to lethal and sub-lethal impacts."[243] The plaintiffs pair this data with Dr. Jordaan's opinion that background temperatures in

[240] Id. (Jordaan) at 66:22-67:5, 68:24-69:5.

[241] See id. (Jordaan) at 70:23-71:1 ("Q. And you didn't use the [Normandeau fish sampling] data that was more recent of the Hooksett Pool? A. I did not use it, no.").

[242] Jordaan Expert Report (Pls.' Ex. 19) at 24.

[243] Id.

the pool already approach or exceed the tolerance levels for various species in some years, and at those times, the Station's operations further endanger fish that are already under threat.[244]

The plaintiffs also identified a period from July 8 through August 14, 2022, when average temperatures at N10 exceeded optimal ranges for certain resident fish, and temperatures at S0 and S4 were higher.[245] When presented with these averages at trial, Dr. Barnthouse concluded that "[i]f [he] had to make a determination only on exceedances of [] laboratory-derived benchmarks," as opposed to direct field data on the composition of the fish population, he would conclude that these thermal conditions were not consistent with the protection of the BIP.[246]

While this evidence could benefit from more specificity as to the frequency and duration of temperature exceedances—parameters that the EPA repeatedly considered relevant to the biological implications of heat for fish—the court nevertheless finds it worthy of some weight. Indeed, Dr. Jordaan's opinion is consistent with the accepted principle that exceedances of preferred temperature ranges can harm the health and survival of fish who are exposed to them. The court also finds it noteworthy that this data

[244] See Trial Tr. 12.2.22 PM (Jordaan) at 106:1-13 ("I don't doubt that in some cases in some years in the Merrimack River . . . the background temperatures[ ] are near the limits of certain species. The issue is that, by then adding more heat to it, you increase that impact quite substantially. . . . [B]ecause the species would be at a stressed, somewhat stressed level, they're even less capable of dealing with those temperature changes, the swings, in particular, but also the increase as time moves on.").

[245] See Trial Tr. 12.2.22 AM (Barnthouse) at 76:12-77:25.

[246] Id. (Barnthouse) at 79:7-17.

comes from recent years, some of which the EPA could not consider when rendering its determinations in the 2020 Response to Comments.

The weight of this evidence is partially mitigated by one factor, however—water temperature and thermal tolerance data are indirect indicators of the status of the BIP. Indeed, during trial, Dr. Jordaan agreed with the proposition that "studies and fieldwork in the Hooksett Pool," such as fish sampling data, "would be the best evidence of what's happening out there."[247] Dr. Barnthouse similarly testified that "field data . . . gives a better indication of what the fish community looks like than do[es] the thermal tolerance data."[248] The court agrees with the logic of these statements, but, as previously stated, still places some weight on the temperature data as evidence of potential harm to the BIP.

4. Conclusion (Count 2)

In sum, of the evidence that the plaintiffs have presented to demonstrate that the Station is violating the Permit by changing the BIP, the court is persuaded, in part, by the temperature data showing some exceedances of optimal temperatures from 2018 through 2022. The weight of this evidence is limited because it is an indirect measure of the status of the BIP, and Dr. Jordaan has conceded that more direct and highly relevant data (Normandeau's fish sampling data from 2010-13) was available, but he did not consider it.

[247] Trial Tr. 10.20.22 AM (Jordaan) at 66:7-13.

[248] Trial Tr. 12.2.22 AM (Barnthouse) at 79:12-17.

Meanwhile, the EPA's determinations that the Station's peaking operations are not harming the BIP, and that the 2020 Permit requirements will assure the future protection of the BIP, are worthy of considerable deference, as they rest on the EPA's technical expertise, sound reasoning, and recent and relevant data. The EPA's conclusions regarding the protective nature of the 2020 Permit requirements, however, must be discounted to a limited extent given that they may be subject to change, and they present other shortcomings in reasoning and evidentiary support, as discussed above.

On balance, the court concludes that the EPA's 2020 determinations regarding the BIP command more weight than the plaintiffs' opposing evidence, given that the EPA's findings warrant deference under Skidmore and the plaintiffs' strongest evidence contradicting them is indirect and limited in quantity and quality. The EPA's 2020 determinations, when combined with the Station's record of compliance with the 2020 Permit requirements during the summer and fall months following the Permit's issuance, indicate that the Station current and ongoing operations are unlikely to violate the Permit by changing the BIP. The court accordingly rules that the plaintiffs have not proven a Permit violation as alleged in Count 2 by a preponderance of the evidence.[249]

[249] The court emphasizes here that the burden of proof rests with the plaintiffs, and not the EPA or the defendants. Thus, even if the court further discounted the EPA's 2020 findings for the reasons discussed in this Section, the defendants' evidence of the Station's compliance with this Permit provision would (at best) be in equipoise with the plaintiffs' evidence of the Station's violations of the provision, and the plaintiffs would still not prevail on this Count. See In re Brady-Zell, 756 F.3d 69, 72 (1st Cir. 2014) ("When the weight of the evidence is in equipoise, a party cannot plausibly be said to have carried the devoir of persuasion" under the preponderance of the evidence standard.).

F. State water quality standards (Count 4)

Count 4 is premised on continuing violations of Part I.A.1.b of the Permit, which provides that "[t]he discharges shall not . . . violate applicable water quality standards." The plaintiffs primarily (though not necessarily exclusively) focus this claim on portions of three New Hampshire statutes which require that the State's waters support a balanced community of organisms and recreational uses, particularly fishing.

Specifically, the first statute provides that "[a]ny stream temperature increase associated with the discharge of . . . cooling water. . . shall not be such as to appreciably interfere with the uses assigned to this class [of water]." N.H. RSA § 485-A:8(II). In particular, the Merrimack River, which is designated as Class B water, must remain "acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies." Id. The second statute provides that "[a]ll surface waters shall be restored to meet the water quality criteria for their designated classification including existing and designated uses and to maintain the chemical, physical, and biological integrity of surface waters." N.H. Code R. Env-Wq § 1703.01(b). Further, "[a]ll surface waters shall provide, wherever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters." Id. § 1703.01(c). The final statute similarly provides that "[a]ll surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region," with "[d]ifferences from

naturally-occurring conditions . . . limited to non-detrimental differences in community structure and function." Id. § 1703.19(a), (b).

This claim presents significant overlap, in both subject matter and evidence, as the previous Counts—particularly Count 2. Essentially, the plaintiffs aver that the thermal conditions within the pool favor warmwater and non-native fish, resulting in an imbalanced community and an alteration in fishing opportunities, in violation of relevant state water quality standards.[250] The plaintiffs do not prevail on this claim because the defendants' evidence of compliance with state water quality standards is more persuasive than the plaintiffs' evidence of purported violations.

The court begins with a brief description of the evidence supporting the defendants' position. Under Section 401 of the CWA, before a NPDES Permit can be issued, "the State in which the discharge originates" must certify that the Permit "will not violate certain water quality standards, including those set by the State's own laws." S.D. Warren Co. v. Maine Bd. of Env't Prot., 547 U.S. 370, 374 (2006) (citing 33 U.S.C. § 1341(a)(1)); see also 33 U.S.C. § 1341(a)(1) ("Any applicant for a Federal license or permit to conduct any activity . . . which may result in any discharge into the navigable water[s] shall provide the licensing or permitting agency a certification from the State in which the discharge originates . . . ."). Consistent with this requirement, the New Hampshire Department of Environmental Services submitted a letter to the EPA in May

[250] See Pls.' Post-trial Findings of Fact (doc. no. 156) at 47-48.

2020, in which it certified that the 2020 Permit satisfies the above state water quality standards.

> Specifically, the NHDES wrote that:
>
> [a]fter appropriate staff review of the Draft Permit, Fact Sheet, Statement, public comments, and EPA's response to comments, State Certification is hereby granted pursuant to Section 401 of the Clean Water Act. The permit will ensure that the requirements of Title 50 RSA 485-4, and administrative rule Env-Wq 1700 (Surface Water Quality Regulations) are met.[251]

In their post-trial brief, the plaintiffs contend that the NHDES' conclusion on this matter is too conclusory to warrant deference under Skidmore. The court disagrees. While the court cannot assess the persuasiveness of the NHDES' reasoning based on the record before it, some deference is still appropriate, given the technical nature of the state water quality standards, the NHDES' relevant expertise, and the agency's designated role in reviewing NPDES permits for compliance with relevant state law. See N.H. RSA 21-O:1 (establishing the NHDES as the agency responsible for "[w]ater pollution control[,]" "[w]ater supply protection[,]" and "[r]egulation of water disposal generally," among other tasks); see also supra Section III.B. The record does not indicate that the partial stay of the 2020 Permit alters the NHDES' conclusion, though the court acknowledges this possibility and partially limits the weight it places on the NHDES certification accordingly. In sum, the NHDES certification, along with the defendants' evidence of compliance with the 2020 Permit requirements, provides some convincing evidence that the defendants are not violating the state water quality standards.

[251] Defs.' Ex. 87.

The plaintiffs' evidence of violations of state water quality standards is significantly less persuasive than the above proof of compliance. First, the plaintiffs do not offer evidence suggesting that the state standards related to the maintenance of a balanced community are more stringent than, or otherwise differ from, the 1992 Permit provision prohibiting the Station from changing the BIP. Accordingly, the court's analysis and conclusions with respect to Count 2 apply to this portion of Count 4.

Next, the plaintiffs' evidence of the Station's interference with fishing opportunities is also unconvincing, as it is scant and/or reliant on the unproven premise that the Station's discharges are meaningfully changing the BIP in the pool. For instance, Dr. Jordaan opined in his report that "the [ ] Station's discharges render the Hooksett Pool unsuitable for native coldwater and coolwater species; therefore they also interfere with recreational fishing for such species."[252] Dr. Jordaan added that "[t]he lack of coolwater species, absence of coldwater species[,] and the presence of thermally tolerant species that are, in the case of largemouth bass and bluegill, tolerant of degraded habitats (Utz et al. 2010) are evidence that the water quality standards are not being met."[253]

As discussed supra Section III.E.1, in 2020, the EPA came to different conclusions regarding the status of the pool's population. For example, the EPA found that, as of 2013, the proportion of coolwater to warmwater species in the Hooksett Pool was "comparable to the community that existed in the 1970s";[254] the Hooksett and Garvins

[252] Jordaan Expert Report (Pls.' Ex. 19) at 23-24.

[253] Id. at 24.

[254] Id. at 261.

Pools had "very similar proportions of warmwater and coolwater species";[255] and the 2010-13 fisheries data did not demonstrate "a decreasing trend in abundance for coolwater species."[256] Under these findings, the opportunities to fish for coolwater species would not have materially changed due to the Station's operations, as of 2013. For the reasons stated supra Section III.E, the EPA's findings regarding the relative abundance of coolwater species in the pool bear more weight than the plaintiffs' conflicting evidence, including Dr. Jordaan's opinion. The plaintiffs accordingly have not proven ongoing violations of state water quality standards by a preponderance of the evidence and do not prevail on Count 4.

G. Annual reporting requirements (Count 5)

Count 5 is premised on alleged ongoing violations of Part I.A.13 ("Paragraph 13") of the 1992 Permit, which provides that "[a]ll biological and hydrological monitoring program data shall be submitted to the NHDES, NHF&GD, USG&WS, and the [EPA] Regional Administrator by December 31 of the following year." Specifically, the plaintiffs claim that the defendants continue to violate Paragraph 13 by providing the agencies with summaries of dissolved oxygen and temperature monitoring data instead of the entirety of the data, which the defendants collected in 15-minute increments. The defendants, in turn, contend that they have continuously complied with Paragraph 13 by submitting summary data.

[255] Id. at 234.

[256] Id. at 235.

The court previously denied the defendants' motion for summary judgment as to this Count after finding that each party's interpretation of Paragraph 13's reporting requirements is reasonable under the plain language of the provision.[257] Given that Paragraph 13 is susceptible to differing, reasonable interpretations, the court concluded that it is ambiguous.[258] As noted supra Section III.D.2, when a permit provision is ambiguous, the court must consider "extrinsic evidence to determine the intent of the permitting authority," Piney Run, 268 F.3d at 270, giving "significant weight to any extrinsic evidence that evinces the permitting authority's interpretation of the relevant permit." Nat. Res. Def. Council, 725 F.3d at 1207.

With these principles in mind, the court recites the undisputed facts relevant to this inquiry. Paragraph 13 provides reporting requirements for hydrological and biological data that the permittee is required to monitor under the Permit.[259] Each year after the 1992 Permit went into effect, PSNH submitted an Environmental Monitoring Program Annual Report to the four agencies listed in Paragraph 13.[260] Once the defendants assumed control of the Station in 2018, they began submitting the annual report to the agencies.[261] Each annual report presented temperature and dissolved oxygen data in the

[257] See Nov. 25, 2020 Summary Judgment Order (doc. no. 65) at 17-21.

[258] Id. at 21.

[259] See doc. no. 93 at AF ¶ 100-01; see also 1992 Permit (Defs.' Ex. 4) at Parts I.A.11-12.

[260] Id. at AF ¶ 99.

[261] Id.

same format.[262] Each report contained the daily maximum, daily minimum, and daily average values for each category of data, as captured at each of the required monitoring stations.[263] On some occasions, the EPA requested the monitoring data in 15-minute increments for specific time periods, and PSNH or the defendants provided that information separately from the annual reports.[264] Finally, the EPA Fact Sheet issued alongside the 1992 Permit does not discuss the addition of Paragraph 13 to the Permit.[265]

This set of facts reveals a consistent course of performance on the part of the permittee—which submitted temperature and dissolved oxygen data in the same format each year—and the permitting authority—which occasionally requested 15-minute temperature data for limited periods but did not request that such data be incorporated into each report. This undisputed extrinsic evidence uniformly contradicts the plaintiffs' contention that Paragraph 13 requires the permittee to report the entirety of the 15-minute monitoring data.

In an attempt to persuade the court otherwise, the plaintiffs suggest that the EPA's course of conduct reflects agency inaction, as opposed to the EPA's interpretation of Paragraph 13. The court declines to accept this unsubstantiated theory, which is contradicted by record evidence demonstrating the EPA's active involvement in evaluating the Station's discharges and the thermal conditions of the pool throughout the

[262] Id. at AF ¶ 102.

[263] Id. at AF ¶¶ 100-01.

[264] Id. at AF ¶¶ 106.

[265] Doc. no. 93 at AF ¶ 105.

permitting process. See, e.g., supra Section III.E.1. The plaintiffs also point to testimony from Hodge and Dr. Jordaan regarding the utility of 15-minute data for assessing the behavior of the Station's thermal plume[266] and understanding the "dynamics of what's actually happening" in the pool.[267] The experts' opinions about the value of 15-minute data do not outweigh the EPA's interpretation of Paragraph 13, as demonstrated by the agency's clear and consistent acceptance of the summary data presented in the annual reports. The plaintiffs' evidence on this Count accordingly falls far short of a preponderance, and the court rules in the defendants' favor on Count 5.

The clerk shall enter judgment and close the case.

SO ORDERED.

Joseph N. Laplante
United States District Judge

Dated: December 6, 2023

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[266] See Trial Tr. 10.18.22 AM (Hodge) at 73:20-74:7.

[267] See Trial Tr. 10.19.22 AM (Jordaan) at 108:15-109:4.